MY JOURNEY INTO INSECT PHOTOGRAPHY

MARK OVERMARS

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Insect Photography

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An electronic version of this book can be downloaded for free from

https://www.insectphotography.org

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Preface

In June 2023 I embarked on a journey to learn everything there was to know about insect photography. I had photographed some insects before, but this time I decided to delve into all its aspects. So, I bought a new camera and lens with insect photography in mind, watched tons of YouTube videos, and started experimenting in all possible ways. I had 20 weeks until the end of the insect season in the Netherlands. Over this period, I took more than 15.000 pictures, and I learned a lot about photographing insects. This book describes my journey, and teaches you everything I learned about equipment, finding insects, photographing them in interesting ways, and post-processing my images to improve them. The book contains some 250 of my insect shots, showing the beauty of these creatures.

One of the first insect shots I took. A Four-spotted Chaser dragonfly. 300 mm lens, 1/640 sec., F/8, ISO 640.

I enjoyed the journey tremendously. For me, insect photography is the perfect combination of technical skills and creativity. And being outside in nature with my camera is wonderful. I am not the most patient person, so insect photography is great: No long waits for an animal to show up, and no handling of human models. No waiting for that perfect light, and no need to get up early for the fog.

Most photography books are written by professional photographers. As a result, they tend to describe the photography process that professionals use. This involves doing tons of research, carrying vast amounts of equipment, and spending lots of time to take that one shot they are interested in.

As a result, many people think that insect photography is hard. But this is not true. In this book I will show you that, with some limited equipment and a little bit of knowledge and skill, it's easy to take great insect shots. My goal is always to make things simpler. I minimize the amount of equipment I must carry with me, and I use fool-proof camera settings. I shoot at easy-to-reach locations and during normal hours. I don't go hunt for a particular insect or lighting condition. I simply go out when I have time and photograph what I find, how I find it. This might not lead to that one perfect picture, but it does produce many satisfying shots.

There is already a considerable amount of information about insect photography, and macro photography in general, available on the web. But it takes a lot of time to find the information you're looking for, and a lot of it is outdated, because photography evolves very fast. So, I 've collected all the information I found useful in a single place. I hope it helps you!

This is not a general introduction into insect photography. It focusses on my journey and my way of working. My type of equipment, my way of shooting, and the things I like. But I hope there is enough information that is useful to you as well. Each chapter in this book describes what I learned during one week of my journey. Most chapters are independent. You can easily skip parts you're not interested in.

One of my more recent shots. A Gorse Shieldbug. 100 mm macro lens, 1/320 sec., F/13, ISO 200, flash.

Much of the material in this book has appeared before, in a series of articles I wrote on Medium. You can find the articles at https://medium.com/@m.h.overmars. I will continue to post more articles there. I rearranged and extended the material considerably to create this book.

The text and photographs in this book are entirely my creations. The insects were shot during 2023 in the Netherlands, unless indicated otherwise. All the insects can be found in the Netherlands, except for the ones in the sections on a butterfly garden, and on buying insects. All insects were alive, unless otherwise indicated.

You might wonder why I offer this book for free. The answer is, I like sharing. It makes my photography work more rewarding. So, please tell others that they can download this book at

https://insectphotography.org. I hope it will bring joy to you and many other photographers. If you like the book, you can make a donation through the website. All proceeds are donated to nature preservation organizations.

This book consists of two parts:

- **Journey**. In 20 chapters I describe what I learned during the 20 weeks of photographing insects, starting from my very first insect shots to using more advanced techniques. I discuss equipment, finding the insects, taking the shots, creating nice compositions, and post-processing your images to improve them.
- **Insects**. While photographing the insects, I got more and more interested in them. In the second part I give some background information about the different orders of insects, describe how to photograph them, and show some of my best shots of these wonderful creatures. This obviously focusses on the insects I see in my country, the Netherlands. But these are largely the same as in the rest of Europe. And even though insects might look different in your country, they still belong to the same orders and have similar features and behavior.

I hope you will enjoy reading this book and start photographing insects yourself. I will continue shooting insects and I might add some more chapters to this book along the way. There is still so much more to learn and see.

Mark Overmars, March 2024

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Acknowledgements

This book would not have been possible without the cooperation of thousands of insects in the Netherlands. Thank you for your willingness to pose, and for your patience when I was struggling with my settings or getting the focus right. Without you this book would have been very boring. And to all the bees and wasps and hornets, thank you for never stinging me.

One of the European Hornets that accompanied me during my journey. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Also, thanks to the many people on the various Facebook groups on insects and macro photography. You were always willing to help me identify the insects, and comment on my shots. The same holds for the readers of my articles on Medium that made many useful comments and encouraged me to write this book.

The people behind waarneming.nl[1] (part of observations.org[2]) deserve special thanks. You built an amazing site to identify my insects and learn more about them. Your experts were always willing to help me and corrected many of my initial wrong identifications. Also, thanks to Peter Pfaff for providing me with the prepared insects, used in week 20 on page 148.

[1] https://waarneming.nl/
[2] https://observation.org/

I would like to acknowledge the people of ON1.[3] They created an amazing photo processing tool that has helped me tremendously in organizing and improving my insect shots. All images in this book have been post-processed using their tool ON1 Photo RAW.

Thanks to the people that read initial drafts of this book and commented on anything, ranging from my global approach to grammar and spelling mistakes. I especially would like to thank Mark McCormack and Souni Breil who gave very extensive feedback on the first draft of the text. Your comments considerably improved the text at many places. Thanks also to Egbert Beuvink and Henny de Bruin for providing me with useful feedback.

And finally, thanks to you for downloading this book and starting to read it. Without readers, a writer is nothing. I hope you find what you are looking for and have as much fun with insect photography as I have.

[3] https://www.on1.com/

My journey

Starting in June 2023, I had twenty weeks to learn how to photograph insects, before the insect season would end in the Netherlands. Each week I concentrated on learning something new, and I wrote down my experiences. This part of the book describes that journey, and it explains to you what I learned, so that you can make a similar journey.

Week 1: My first insect shots

I have always enjoyed photography, and taking pictures of nature, like landscapes and wildlife. I had taken an incidental shot of an insect, like a butterfly, but I never focused on it. But now that I had more time, I decided to dive into photographing insects. And guess what: I really liked it, and it was much easier than I thought.

I am the kind of guy that likes to prepare carefully. So, before starting on my insect photography journey, I did a lot of research. I watched many YouTube videos about macro and insect photography, but these all seemed to be made by very experienced photographers for which everything was easy, although they often conveyed the impression that insect photography is quite complicated. However, they did give me some tips on the kind of camera to get and how to get started.

Broad Scarlet dragonfly, shot with a Canon R7 camera and the RF 100–400 mm lens at 400 mm. Shutter speed 1/500 sec., aperture F/11, ISO 800.

A new camera

I needed a new camera. My old camera (a Sony RX10 mark 4) was not good enough for what I wanted to achieve. So I did a lot of research into new cameras, and in the end I decided to buy the Canon EOS R7. In the next chapter I will get into details about why I think this is a good camera for photographing insects, but the main reason was that it is an APS-C camera, which gives some "free" additional magnification and is also cheaper than comparable full-frame cameras. It has 32-megapixel resolution, which allows me to do some digital cropping, giving even more magnification. And it has built-in focus stacking functionality and can even combine the images inside the camera. If

you don’t know what all that means, don’t worry! I will be investigating it and explaining it in a later week. All images in this book were shot with this camera.

As a lens I got the RF-S 18–150 mm kit lens that you can buy cheaply as a bundle with the camera. This is clearly not a macro lens, but, as it turns out, you can take great macro shots with it. Together, this cost me just short of 2,000 euros (in the Netherlands). I also got the Canon RF 100–400 mm telephoto zoom lens, but this lens was not meant for my macro photography, although it does have its use, as some of the images in this chapter show.

It is not necessary to buy a new camera if you what to start with insect photography. Any camera with interchangeable lenses will do. You can even take nice macro shots with mobile phones. But having the right camera and lens makes insect photography considerably easier.

First insect shots

This camera has zillions of settings, but most can be left unchanged. I will discuss some key settings later. To start out, make sure you set autofocus to continuous (servo) to keep the subject in focus while you move the camera. Use the smallest spot focus point to make sure you focus on the desired position. Even though many macro books recommend that you use manual focus, with modern cameras and lenses autofocus works fine. And it is so much easier.

I was afraid that I would scare the insects away when getting close to them, so for my first insect shots I decided to use my RF 100–400 mm telephoto zoom lens. This lens can achieve reasonable magnification. At 400 mm focal length, I could stay a meter away from the subjects. After a few shots in my garden, I biked to a little pond a kilometer away from my home, where there were lots of dragonflies and other insects. Dragonflies are not the easiest to photograph, because they fly around most of the time. But with a little patience I managed to get some first shots, like the Broad Scarlet dragonfly above. I also shot the Golden-eyed Horsetail below. These insects can give nasty bites, and they follow you around very persistently. But they look beautiful with their colored eyes.

Golden-eyed Horsetail, using the RF 100–400 mm lens at 400 mm. Shutter speed 1/500 sec., aperture F/11, ISO 1250.

I soon realized that – to get a reasonable depth of field (that is the part of the image that is in focus) – I needed an aperture of at least F/11 or F/13, and I needed a fast shutter speed of around 1/500 of a second, because of the movements of the insect and the wind. The image stabilization of the camera and the lens work great for your own movement, but not for the subject movement.

To control both the aperture and the shutter speed myself, I had to use the manual exposure mode of the camera. But I used automatic ISO that makes the camera decide on the correct ISO value. This guarantees that the exposure is always correct. You often have little time to take the shot, so you don't want to be bothered with getting the exposure right. Better concentrate on getting the insect in focus, that's already hard enough.

With such setting for aperture and shutter speed, the ISO value can get rather high, especially when the insect is in the shade. But for most modern cameras an ISO value of up to 6400 is still acceptable, although you are recommended to apply some noise reduction in post-processing.

Post-processing

The JPG images that the camera produces are very good. But I have always preferred to shoot in RAW format as well and do some minor post-processing. Some people find post-processing daunting, but it is not hard, and it will improve your images considerably. I strongly recommend you spend some time on it. Initially I just did some basic cropping, raw processing, and noise reduction for high ISO values. For example, this ant image required a lot of cropping and noise reduction to get a decent result. In week 9 on page 70 I will explore post-processing of insect shots in more detail.

An ant, shot with the RF 100–400 mm lens at 400 mm. Shutter speed 1/500 sec., aperture F/11, ISO 2500.

Getting closer

The difficulty of working with the 100–400 mm lens is that with such a large focal length, finding the subject in the viewfinder and keeping the camera locked on it is difficult, especially with a bit of wind (in the Netherlands there is always wind). A small motion of the camera has a big impact on what you look at. Photographing smaller insects was especially difficult. So, I decided to switch to my RF-S 18-150 mm lens.

When you reduce the focal length of the lens, you have to get a lot closer to the insects… and when I say a lot, I mean a lot. The 18-150 mm lens gets the best magnification at 50 mm focal length. For that to work well, the insect needs to be about 7 centimeters from the front of the lens. That was a bit too close for me, so I started putting the lens at about 60 mm focal length, which gave me a working distance of 12 cm from the front of the lens.

Surprisingly, shooting from close range was easier than I thought. As long as I moved slowly, most insects didn't fly away. It seems like they don't consider cameras a danger. Also focusing was not that difficult, although the depth of field gets small when photographing small insects. To remedy that, I used an aperture of around F/13 to get enough depth of field and a shutter speed of at least 1/180 of a second to freeze small motions. (With a shorter focal length of the lens you can use a smaller shutter speed.) I continued to use auto ISO because I didn't want to worry about exposure too much.

A small Cuckoo Wasp that I found on a chair in my garden. RF-S 18–150 mm lens at 66 mm. Shutter speed 1/180 sec., aperture F/13, ISO 500.

Focus

Focus is one of the most important and challenging aspects of insect photography. Because of the large magnification, the area that is in focus is very shallow. Any small motion of the camera will throw the focus off. In the past, the cameras' autofocus systems could not keep up with these motions. Hence, it was always recommended that you use manual focus for macro photography. But times have changed.

Modern cameras and modern lenses have very fast autofocus. My Canon R7 has no problem keeping the correct position (normally the eyes of the insect) in focus, even though I cannot hold the camera completely still. This is a game changer. With autofocus, insect photography becomes a lot easier and more satisfying, with most shots in focus. There is still a place for manual focus, but I only use it in rare cases where the camera fails to focus correctly.

Wind and motion of the insect though are different. It is very difficult to keep focus on the correct spot when that spot is moving all the time. I strongly recommend that you find a place behind some

kind of windbreak that shields your subject from the wind to take your pictures. Also, ignore insects that keep moving around. There are plenty of other insects to photograph.

Because it is such an important topic, in week 5 on page 35 I will delve much deeper into focus.

Finding insects

Initially, it is not so easy to find insects. You might look for some flying bees and follow them until they land on some flower. Then you try to take a shot. But I soon found out that this is a poor strategy. These insects are active and quickly fly away again. An insect that is already resting is much easier to approach, but you need a better eye to find them.

A China Mark Moth hidden under a leaf. Lens at 60 mm, 1/125 sec., F/16, ISO 2500.

I learned that you must slow down a lot. Stand in front of some plants and keep looking around. Anything that does not look regular might be an insect. Also look under the leaves. Many insects prefer the shade, and also move less when in the shade. Soon you start noticing lots of small insects, little spiders, flies, and bugs. And most of them don't try to escape if you slowly approach them with the camera.

You don't need to travel far to photograph insects. If you have a garden, this can already provide ample opportunities. Otherwise go to a park in the neighborhood, or simply look at trees, bushes, and gardens in the street. Any type of habitat or resource such as food, water or shelter may have insects in their vicinity.

Some advice

Take it easy. Only photograph insects that are at a comfortable height and that you can easily reach. Move slowly and take your time. You will be surprised how many insects will simply stay in their spot and allow you to photograph them. Of course, beetles are easier than flies and some insects, like bees, hardly ever rest for a prolonged period. So initially, avoid those.

A flying Red-tailed Bumblebee. RF 100–400 mm lens at 200 mm, 1/1500 sec., F/8, ISO 640. It took a lot of patience and at least 40 shots to get this image.

Take many pictures. If you think you have enough, take more. The image above of the flying bumblebee was one out of some 40 images I took in my garden. The others were not in focus, the insect looked in the wrong direction, the composition was bad, and so on. Always take more pictures! Your memory card can store so many. Look back at the images in your viewfinder. Magnify them to check whether they are in focus. Throw away everything that is not good. You will never use them again in the future. And if all are poor, try to take some more shots. You will improve with practice! During my journey the number of good shots quickly went up, and less shots were required for success.

Try to take shots from many different directions. A photograph looking the insect in the eyes or a side shot are often more appealing than a top-down shot. Also, try to pay some attention to the background. I noticed that I was so concentrated on getting the insect in focus that I often forgot this. In week 8 on page 57 dealing with composition, we will investigate different ways to position the camera.

Shot of the week

Each week I will pick one insect picture I took that week that I really like, or that has some interesting story behind it. This week I picked the very first shot of an insect I took; on the day I got my new camera. It shows a hoverfly, called a Migrant Aphideater, on one of the flowers in my garden. It looks a bit like a wasp, but it is a harmless fly. I was amazed by the amount of detail you could see in the image. It is clearly not the best picture, but this shot set my insect photography journey in motion.

RF 100–400 mm lens at 400 mm. Shutter speed 1/500 sec., aperture F/8, ISO 800.

Week 2: Cameras and lenses

To photograph insects, I obviously needed a camera and a lens. In this chapter I will discuss the most important aspects of the camera and lenses for insect photography, and how it led me to buying a Canon R7 camera. If you want to buy a new camera for insect photography, this information will help you as well. If you already have a camera that you plan to use, it will give you some insight into the important features and how these will affect your insect photography.

The camera body

Nowadays you can take reasonable insect shots with a mobile phone. For example, iPhone Pro models have macro capabilities. You can also buy cheap macro lenses that you can clip onto your phone. But my goal was to take the best insect photos possible, and for that you need a camera with interchangeable lenses. There is a huge variety of cameras on the market. To make a knowledgeable choice, it is important to understand some of the key features, and how they impact insect photography.

Mirrorless or DSLR

DSLR cameras use a mirror to reflect the view through the lens into the viewfinder. This mirror flips away when you take a shot. The view through the viewfinder is excellent, but DSLR cameras have several disadvantages, like slower autofocus and shooting speed, and are noisier. **Mirrorless cameras** don't have a mirror; instead, you see the image the sensor sees on the display on the back of the camera or in an electronic viewfinder. Since the quality of the electronic viewfinders has improved tremendously, the advantages of DSLR cameras have largely gone, and all brands are focusing on mirrorless cameras for the future.

For insect photography a mirrorless camera is the better choice. The noise of a DSLR might scare insects away. And fast shooting and high-quality autofocus help tremendously. Make sure you get a camera with an electronic viewfinder and not just a display. Looking through the viewfinder and pushing your face against the camera gives more stability when taking the shots, which helps in focusing on the insect.

Sensor size

Most modern cameras either have a **full-frame sensor** or an **APS-C sensor**. Full-frame sensors are 36x24 mm in size. An APS-C sensor is about half that size. A full-frame sensor allows for larger pixels or for more pixels. Larger pixels give more dynamic range and less noise for high ISO values. So, the image quality for full-frame cameras is supposed to be better than for APS-C cameras. But the sensor technology is developing fast, and modern APS-C sensors have a better image quality than full-frame sensors from just a few years ago. Also, the resolution of the APS-C sensors has increased.

When using an APS-C camera the image is cropped to the smaller sensor size. Hence, such sensors are also called **crop-sensors**. This is demonstrated in the figure below. The image on the left shows the picture when using a full-frame camera. When you use the same lens and the same focus distance on an APS-C camera, you get the picture on the right. The grey area does not fall on the

sensor, and it is not recorded. When printing the resulting images, the APS-C one shows a smaller area and, hence, there is more detail visible.

The image on the left is produced by a full-frame camera, while the center area in the image on the right is produced by an APS-C camera.

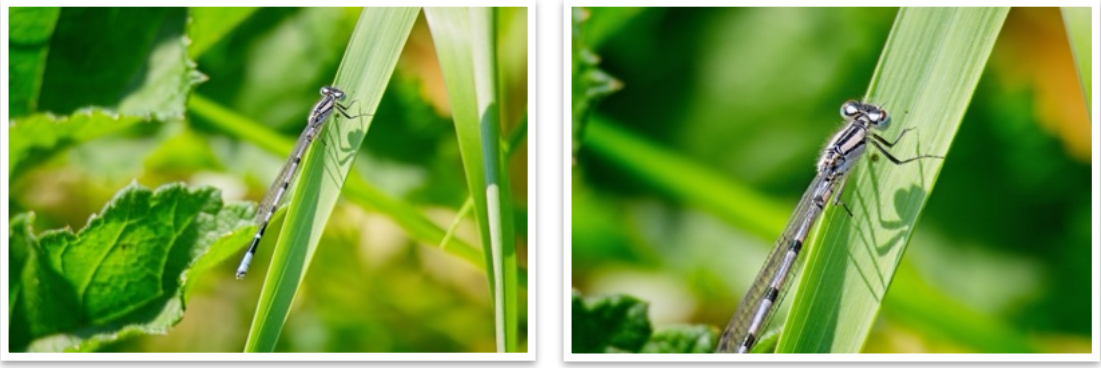
Using a crop-sensor has a huge advantage for macro photography. With the same lens, you get an extra magnification factor of 1.5 or 1.6 (Canon). For example, when you use a 1x1 macro lens on a full-frame sensor the image covers a width of 36 mm, while for an APS-C sensor this becomes 24 mm. Also, with the same magnification and aperture, the depth of field is larger, making it easier to get sharp images. This is great for insects! A disadvantage is that the background is also less blurry – the bokeh is less nice. You might need some post-processing to make the insect stand out from the background. I will investigate magnification factors and depth of field in week 6 on page 41.

APS-C cameras have different size and weight specifications than full-frame cameras. The bodies and lenses are smaller and lighter (and often also cheaper), which is a big advantage. But for many brands, the APS-C cameras have a smaller body, which might be more difficult to hold steady. Another disadvantage of APS-C cameras is that they are less suited to wide-angle photography, like in landscapes, although this is primarily caused by the lack of specialized wide-angle lenses designed for APS-C.

Resolution

Resolution refers to the number of pixels on the sensor. We normally talk about **megapixels** (MP). Most modern cameras have at least 20 MP resolution and some go up to 50 MP. You don't need that many megapixels for showing or printing your images. Eight megapixels is enough for 4K displays and for 30 x 20 cm (12 x 8 inch) prints in perfect resolution (300 dpi). And it still gives excellent quality when printing at 48 x 32 cm (19 x 13 inch).

So why do you need more resolution? The main reason is **digital cropping**. When you have excess resolution, you can crop the image in post-processing. This is very important for insect photography. Images with a 32 MP resolution, like the ones produced by my Canon R7, can be cropped to a quarter of the size, and you still have an 8 MP image left. Such a crop effectively doubles the magnification. A 1x1 macro lens on an APS-C camera with the extra digital crop ends up showing an image width of just 12 mm. And, again, cropping is better than extra magnification when it comes to depth of field.



When your resolution is large enough, you can crop the image in post-processing to show more detail. The image on the left is the original 32 MP image. The image on the right is cropped to 8 MP.

Image stabilization

There are two techniques to stabilize images: in the camera body, and in the lens. Modern cameras often have **in-body image stabilization**, abbreviated as **IBIS**. This means that when you move the camera, the camera tries to correct this by moving the sensor in the opposite direction. Image stabilization is meant to avoid motion blur caused by moving the camera and allows for a slower shutter speed. When doing macro photography, you need a fast shutter speed anyway to avoid blur caused by motion of the insect or due to wind. So, camera motion blur is not a big issue. But when shooting handheld, image stabilization helps to keep the subject in view. And it helps with focusing on the desired position.

Also, many lenses have **optical stabilization** that compensates the camera motion by moving the glass. When you use such a lens, IBIS is less important, although it does help a bit. But many macro lenses have no stabilization. So, in-body image stabilization is useful, unless you are sure you are always going to use lenses with optical stabilization.

Autofocus and manual focus

All modern cameras have **autofocus**, although the lenses might not support it. But there are considerable differences between cameras. In macro photography, the speed of the autofocus is crucial. This is determined both by the camera body and by the lens.

When you are shooting handheld, you are unintentionally moving the camera constantly. When using a high magnification, such small motions will have an impact on the focus. So, when using autofocus, the camera must quickly adapt to this motion, to keep the desired position in focus. In the past, autofocus was not fast enough to keep up with these motions. Macro photographers always used manual focus instead. But this has changed with modern cameras and lenses. I almost always use autofocus with my Canon R7 and it has no problem keeping up with my camera motion.

Some cameras have functionality to focus on animals and on eyes (although insect eyes are something special). For photographing insects this is only relevant when insects move around quickly and are not too close.

If you plan to use manual focus, autofocus functionality is less of an issue. In that case, focus assist functions become important, in particular focus peaking and magnification. Canon has an additional feature called focus guide which is very useful. For more information, see week 5 on page 35 where we investigate focus in more detail.

Fast autofocus is important when insects move around, like this Common Carder Bumblebee. 400 mm, 1/350 sec., F/8, ISO 200.

Burst mode

Modern cameras can shoot images continuously at high speed. This ranges from 4 to over 30 images per second. Mirrorless cameras are considerably better at these burst modes than DSLRs. The total number of images during such a burst is often limited, because of a limited buffer size. There can also be other restrictions, like the use of the electronic shutter only. And it is sometimes not possible to use a flash while shooting continuously.

Continuous shooting can help when photographing insects. If you take a burst of images, it increases the chance that one is perfectly focused, although I do not recommend this way of working. Better learn to keep the camera still and focus correctly. Shooting continuously can be useful for photographing moving insects, or insects that take off from or land on a flower. In these types of cases, you'd better combine this with continuous subject tracking for the autofocus.

Additional features

Advanced modern cameras can also do **focus bracketing**. Here several shots are taken with different focus depths. These can then be combined to create an image with a much larger depth of field. This is very useful for insect photography, and I would recommend that you buy a camera that has this feature. The Canon R7 can even combine the images in-camera. For more information, see week 16 on page 120 where we investigate focus bracketing.

Canon has a new feature called RAW burst in which you can store images that were taken during the past half second. So, you never miss the moment. I use this to get the perfect image of an insect taking off. A disadvantage is that it does not work with flash. Some other camera brands have similar functionality.

Summary

If you want to get the perfect camera for insect photography, the following features are important:

- A modern mirrorless camera with a good electronic viewfinder. Check when the camera was introduced. Technological development goes fast, and newer cameras produce better images with less noise.
- APS-C sensor size, for extra magnification.
- At least 24 MP resolution, and preferably more, for digital cropping.
- Very fast autofocus.
- In-body image stabilization.
- Reasonably fast continuous shooting, like 15 frames per second.
- Focus bracketing.

The Canon R7 APS-C camera that I bought for insect photography.

After some careful comparisons I bought the Canon R7, which is Canon's top APS-C camera, introduced in June 2022. It has 32 megapixels, good image stabilization, fast autofocus (depending on the lens you use), lots of focus features, and a continuous shooting speed of up to 15 frames per second (30 for short bursts). It has tons of additional features. It can do focus bracketing and has the possibility to combine these images in the camera. Other brands have cameras with similar features. Read some reviews and, if possible, rent two or three different cameras and try them out before you buy.

Also, think about the other things you want to do with your camera. If you want to do landscape photography as well, or shoot events in low-light conditions, you might want to get a full-frame camera instead.

Lenses

A camera body is nothing without a good lens. You can buy lenses that are designed for macro photography but that is not necessary to start photographing insects. A standard lens will go a long way, especially when you combine it with extension tubes, which are discussed in week 7 on page 47. Here are some important aspects to consider.

Magnification

Each lens has a **maximum magnification factor**, that is reached at the **minimum focus distance**. When you use a zoom lens the maximal magnification factor is reached at a particular focal length. Each focal length you choose results in a different maximal magnification factor. You can normally find this in the specs for the lens. For example, I bought the Canon RF-S 18-150 mm lens together with my camera. It is a kit lens, but the quality is pretty good. The lens reaches its maximum magnification at a focal length of 50 mm. Here the magnification factor is around 0.45, which is great for a standard lens. Because the R7 is an APS-C camera, you get an extra factor of 1.6, which brings the effective magnification to 0.7. And if you do some digital cropping, you get above 1, which is considered the threshold for macro.

Midge, shot with the RF-S 18–150 mm lens at 60 mm. 1/320 sec., F/13, ISO 200, flash, cropped to 8 MP.

As a rule of thumb, if your lens has a maximum magnification of at least 0.3, and you have an APS-C camera with a reasonably high resolution, you can take great insect shots. But you need to know at which focus distance this magnification is reached. For the RF-S lens I have, this distance is 17 cm. That sounds like a lot, but it's measured from the sensor. From the front of the lens it is only 6 cm. So you must get close to your subject.

Focal length

The **focal length** of a lens is the distance between the sensor and center of the lens. The larger the focal length, the smaller the angle that is projected onto the sensor. Wide angle lenses have focal lengths smaller than 35 mm. Telephoto lenses can have focal lengths of 200 mm or more. On an

APS-C camera, the effective focal length is 1.6 times larger. So, a 100 mm lens on an APS-C camera acts like a 160 mm lens on a full-frame camera.

If you use a lens with a small focal length, you must get considerably closer to the subject than if you use a large focal length to get the same magnification. For example, to get a magnification of 0.4 on my RF-S lens at 60 mm, the distance from the sensor is 17 cm. If I use my Canon RF 100–400 mm telephoto lens at 400 mm, I can stay 1 meter away from the subject while getting the same magnification.

So, a longer focal length might sound like the better choice. But there are also downsides. When the focal length increases, the depth of field decreases (for the same magnification). So, using my 60 mm lens results in a much larger sharp area than using the 400 mm lens. And small motions of a long lens result in large changes in the visible area, making it much harder to keep the insect in the viewfinder and to focus on the correct spot. For this reason, you need a faster shutter speed with long lenses.

Broad Scarlet dragonfly shot with the RF 100–400 mm lens at 400 mm at 1.75-meter focus distance. 1/500 sec., F/11, ISO 1000.

The ideal lens for most insect photography has a focal length between 65 and 100 mm. A shorter lens forces you to get too close to the insects, while a longer lens results in a depth of field that is too shallow. However, if you want to photograph butterflies or dragonflies, you might want to use a longer lens of 200 mm or more.

Aperture

Each lens has a **maximum aperture**. The wider this is (the lower the F-number) the more light can reach the sensor. For insect photography, it is not important that the lens has a wide maximum aperture. You want a large enough depth of field, and for this you need a narrow aperture. I try to use F/13 most of the time.

The aperture also influences the image quality. When using a low F-number, the quality can be less, which is most noticeable at the corners. When using a high F-number you can get diffraction, which reduces the overall image quality as well. The best image quality is normally achieved with an

aperture of around F/8. But you need to balance this with the desired depth of field. This is something to consider when buying a lens. With an APS-C sensor, lower quality at the corners is not an issue, as these do not show in the image but less diffraction is a plus.

Autofocus

As indicated above, fast autofocus is very important for insect photography, unless you plan to use manual focus. The speed of autofocus is determined by the camera body that must do the calculations, and the lens that has motors to change the focus distance: The faster these motors react, the quicker focus is reached. A modern camera with an older lens does not work well enough, nor the other way around. Unfortunately, lenses with faster autofocus are normally more expensive. And manual lenses, like many dedicated macro lenses, of course have no autofocus at all.

Summary

A good lens for insect photography has the following properties:

- A maximum magnification factor of at least 0.3.
- A focal length between 65 and 100 mm. For butterflies and dragonflies, you might want a length of 200 mm or more.
- Fast autofocus, in combination with your camera body.

The Canon RF-S 18-150 mm lens I got ticks all these boxes. A dedicated macro lens is obviously the best, but it is a large investment and not necessary. I recommend that you only start looking for a macro lens after you have shot a considerable number of insect pictures. I bought mine after two months, when I knew insect photography was the thing for me. I discuss buying a macro lens in week 10 on page 78.

Shot of the week

Spiders are not insects. They have eight legs rather than six. But I include them in this book anyway because I like photographing them. This wolf spider, carrying her eggs around, was my first experiment with the in-camera focus stacking of my Canon R7. While I tried to hold the camera still, it took 10 images at different focus depths, and then combined them into a single image. As a result, the complete spider is sharp, which would be impossible with a single shot. Notice the hard shadows caused by the sunlight. I normally do not like that, but for spiders it adds a bit of additional creepiness.

400 mm lens, 1/500 sec., F/8, ISO 800.

Week 3: Exposure

Exposing your image correctly is always important in photography. I soon realized that for insect photography, it is especially important that you pick the best shutter speed, aperture, and ISO sensitivity for your shots. Without the correct shutter speed, you get motion blur. Without the correct aperture, your insects won't be in focus, and with the wrong ISO sensitivity, the image quality goes down and you get too much noise.

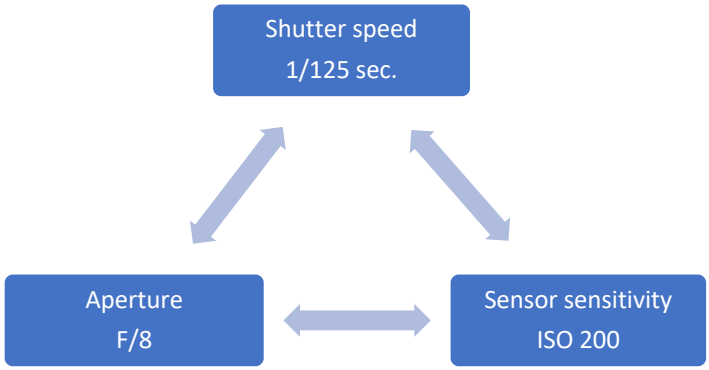
Insects are sometimes sitting in the sun and other times in the shade. This changes the amount of light considerably, and you must adapt to that. In this chapter I give some background on exposure and explain the settings that I found out work best, most of the time.

The exposure triangle

You've probably heard about the exposure triangle before, but because it is so important for insect photography let me recap. To take a well-exposed photo, the right amount of light must fall on the sensor. This is determined by three values, which together form the **exposure triangle**:

- The **shutter speed**. The longer the shutter is open, the more light will fall on the sensor. This is indicated by a fraction of a second, like 1/125 of a second.
- The **aperture**. This is the diameter of the hole in the lens through which the light falls on the sensor. The smaller the hole, the less light reaches the sensor. This is indicated by the F-number, like F/4 or F/8.
- The **sensitivity** of the sensor. When the sensor is set in a more sensitive mode, less light is required to produce the image. This is indicated by the ISO value, like ISO 200.

You must balance these numbers to get the correct exposure. If you change one of them, you must also change the others to keep the final exposure the same. The camera can do this for you, but that is not recommended in general, and especially not in insect photography.



The exposure triangle.

Photographers often talk about **stops**. Adding a stop means doubling the amount of light that reaches the sensor, and subtracting a stop means halving the amount of light. So going from 1/125 to 1/250 sec. shutter speed subtracts a stop, while going from ISO 100 to ISO 200 adds a stop.

Each of the three aspects of the exposure triangle has important side effects. So, it is good to study them in a bit more detail and indicate how they affect insect photography.

Shutter speed

The shutter speed determines how long light falls on the sensor. The traditional **mechanical shutter** consists of two curtains. The first one opens the path for the light to the sensor and the second one, that comes just behind it, closes it again. An **electronic shutter** works without curtains. The camera first clears the values in the sensor, waits a little while, and then reads out the new values.

Mechanical shutters are kind of noisy and have limited durability. Also, they can cause some slight camera motion, called **shutter shock**, which might blur the image, especially when you are doing macro photography or using a lens with a longer focal length.

Electronic shutters make no noise, which is good, because it won't scare the insects away. However, they do suffer from **rolling shutter** effects. This is caused by the fact that not all parts of the sensor are read out at the same moment. When the subject is moving fast, the top part of the image might show a different position of the subject than the bottom part. When insects are motionless this is not an issue. But when they are flapping their wings, rolling shutter can occur, and it looks weird. Another big disadvantage of electronic shutters is that they often don't work with a flash.

A combination that is common in modern cameras is called **electronic first curtain**. It does not use the mechanical first curtain, but instead clears the sensor. It does use the second curtain though, to stop the light from reaching the sensor. This avoids both shutter shock and rolling shutter effects. It is still somewhat noisy, but only after the shot is taken. It does work well with a flash. This is the preferred mode for insect photography if your camera supports it.

A very red Broad Scarlet dragonfly. I used my 400 mm lens and, even though the insect was motionless, to avoid motion blur I needed a shutter speed of 1/500 sec., F/8, ISO 500.

The **shutter speed** is simply the time the shutter is open. It is measured in fractions of a second. A typical shutter speed is 1/125 of a second. Halving the shutter speed to 1/60 sec. will add a stop of light. Doubling it to 1/250 will remove a stop. When the shutter speed is slow, like 1/60 of a second or slower, movement of the camera or the subject will result in motion blur. The slower the shutter speed, the larger the amount of motion blur. **Motion blur** can be caused by motion of the camera, motion of the insect, or motion of the leaf the insect is sitting on (due to wind). When you are photographing at a close range, this effect is exaggerated, and, hence, a fast shutter speed is highly recommended. Use 1/125 of a second or faster, unless there is no wind, and you are shooting from a tripod.

When you use a lens with a large focal length, like 400 mm, you need a faster shutter speed because motions are exaggerated. A rule of thumb is that the shutter speed should be at least 1 divided by the focal length, so 1/400 sec. for 400 mm. But when shooting with a high magnification, this is sometimes not enough, and you need to increase the shutter speed even further.

Most modern cameras and lenses have image stabilization. This can solve motion blur due to camera motion, but not motion blur caused by wind or insect movement. Moreover, for macro photography it does not work very well, so don't rely on it.

If you want to photograph insects in flight, you need a much faster shutter speed. Insects can flap their wings at amazing speeds. You will need at least 1/1000 of a second, and preferably 1/2000 or 1/4000. For example, the shot of the week at the end of this chapter, of a humming-bird hawk moth drinking nectar from a flower, was shot with 1/2000 sec. shutter speed. The wings still show motion blur. I like that effect though, as it suggests motion. To use such a fast shutter speed and still have a proper exposure, ISO 2000 was required.

Using a flash avoids motion blur, as it freezes the action. However, ambient light also illuminates the subject, and if the ambient light is strong, it can result in ghosting effects where you also see a vague, blurred image of the subject. There is normally a minimum shutter speed required to use a flash. For my camera this is 1/320 sec., but it might be different for your camera. If you shoot insects using a flash and you don't want to see the effects of ambient light, best use that value. I will discuss flashes in the next week on page 26.

Aperture

The **aperture** indicates the diameter of the opening or iris in the lens through which the light reaches the sensor. The smaller the opening, the less light gets through. People also talk about how open or closed a lens is. It is indicated by the F-number, like F/4 or F/8. The value of the aperture is a bit weird. A larger number corresponds to a smaller diameter, so less light. Also, doubling the number does not halve the amount of light but reduces it to one quarter (because the amount of light is determined by the area of the opening, not the diameter.)

The standard sequence of aperture values is: 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, and 32. Each of these represents one stop of light. Normally, there are additional values in between, like F/6.3 or F/13. If you want to understand this more precisely, the F-number is the focal length of the lens divided by the diameter of the hole. So, for a 100 mm lens, F/4 corresponds to a diameter of 25 mm. For more detailed information, see the Wikipedia page on F-numbers[4].

When you read about lenses, they often talk about the maximum aperture, which corresponds to the smallest F-number available. **Fast lenses** are lenses with a large maximum aperture, so they have

[4] https://en.wikipedia.org/wiki/F-number

a large maximum opening. For example, an F/1.4 lens is very fast. Fast lenses can be used in low light conditions and give you more options to play with the depth of field. But they are also way more expensive, and heavier. For insect photography, having a fast lens is not very important, as you almost always use a narrow aperture.

A Meadow Brown butterfly, shot from above. 400 mm, 1/500 sec., F/8, ISO 160. Aperture F/8 was barely enough to get the insect in focus. The tops of the wings are not sharp.

The F-number and distance to the subject have a significant influence on the **depth of field**. Depth of field is defined as the difference in the distance between the nearest and the furthest point that is in focus. The larger the F-number, the larger the depth of field. I will discuss depth of field in more detail in week 6 on page 41. To get insects sharp, you need a large depth of field. For this, you preferably shoot with an aperture of at least F/8. I normally use F/13.

However, choosing a smaller aperture has a negative side effect, called **diffraction**[5]. Because of diffraction, the quality of the image is reduced when using larger F-numbers. For most lenses, the best image quality is achieved around F/8. The amount of diffraction also depends on the quality of the lens. For my lenses I consider F/13 the best trade-off between depth of field and image quality.

Sensitivity

In the old days of analog photography, you could buy films with different light sensitivity. This was indicated by the ISO value. In the digital era this has become an indication of the sensitivity of the sensor, which you can change. A low number corresponds to a low sensitivity. Most sensors have a lowest sensitivity of ISO 100 and a highest sensitivity of ISO 32,000 or higher.

Each time you double the ISO value, the amount of light that is required for a properly exposed shot is halved. So, ISO 200 needs half the light of ISO 100, and ISO 1600 needs just 1/16 of that amount of light. Stated differently, doubling the ISO value adds one stop of light.

[5] https://en.wikipedia.org/wiki/Diffraction

The sensitivity is often used to get a correct exposure for a desired shutter speed and aperture. ISO balances the exposure triangle. Many photographers set it to automatic. With this setting, the camera determines the correct ISO value for the given shutter speed and aperture. But be warned … High ISO values have a negative side-effect: **noise**. The higher the ISO value, the more noise is introduced in the image. Sensors are not perfect and small errors in the light values measured show up as noise with higher ISO settings. When using a high ISO values the sensor must distinguish between very small variations in light, and these errors will have bigger effects.

The size of the pixels on the sensor influences the amount of noise. The larger the pixels, the more light they catch and, hence, the less noise they introduce. Cameras with large sensors are less sensitive to noise. Meanwhile, cameras with a higher resolution (number of megapixels) introduce more noise. But sensor technology is improving rapidly. Modern cameras can have smaller sensor sizes and a higher resolution, and still produce very little noise. And there is excellent AI-based software to remove noise from images afterwards. See week 9 on page 70 for more details on improving your images.

For insect photography, sharp images are crucial. Hence, noise is a serious issue. I prefer to shoot with an ISO value of at most 400. If necessary, I will increase it up to 2,000, but not higher. This does depend on your camera, so you are recommended to do some experiments to see what is acceptable in your situation.

A Common Drone Fly, which looks like a bee. Because it was moving around a lot, I used 1/2000 sec. shutter speed and F/6.7. It was in bright sunlight, so ISO 200 was still enough.

The best settings

What settings to use depends a lot on the amount of light that is available, (and on the effect you want to achieve). When it is sunny and the insect is in the sun, I use a shutter speed of 1/125 of a second or faster, an aperture of F/11, and ISO 100–400 depending on the actual amount of light. When there is no sun or the insect is in the shade, you easily lose 3 or 4 stops of light. I recommend not to reduce the shutter speed to avoid motion blur unless you use a tripod. So, I typically use 1/125 sec., F/8, and ISO 400–1600.

Clearly, this depends on the circumstances under which you are photographing. When there is wind you need to use a faster shutter speed and narrower aperture. When the subject is large, like when photographing a butterfly, you can use a wider aperture of F/5.6, and a lower ISO value.

To be able to control both the shutter speed and the aperture, you need to work in manual (M) mode. I set the ISO to automatic, allowing a range from 100 to 2000. You can change this in the ISO settings of your camera. You often don't have much time when photographing insects, so trying to control the complete exposure triangle manually is too much of a hassle for me. When I want to change the exposure, I use exposure compensation. With **exposure compensation** you can tell the camera to overexpose or underexpose the shot. You indicate the number of stops. For example, a value of -2 would tell the camera to underexpose by two stops, so the image becomes considerably darker. When setting a fixed shutter speed and aperture, this means that the camera will use an ISO value that is a quarter of what it would normally use.

Canon has an interesting extra mode for this. Instead of manual (M) mode, you can use flexible value (Fv) mode. Here you can control all four settings: shutter speed, aperture, exposure compensation, and ISO. With one control wheel you select the setting you want to change and with the other you change that setting. You can set each of the settings to automatic, in which case the camera controls it. This sort of combines all the other modes. If you have a modern Canon camera, I strongly recommend you use this mode. It is very convenient.

Under- or overexposure

When there is little light and you do not want to decrease the shutter speed or increase the aperture, you have two options: use a high ISO value or underexpose the image. On the web you regularly read that you'd better underexpose the image and correct that in post-processing. Don't do that! With modern cameras and modern noise reduction software, it is better to use a high ISO value.

Some cameras are **ISO invariant**. They will produce the same results in terms of image quality if you underexpose your photograph and then raise the exposure in post-processing as if you had increased the ISO. When this is the case, there is also no point in underexposing your shots.

In fact, when possible, it is recommended to slightly overexpose, typically with one stop, and correct this in post-processing. This is called **Expose-To-The-Right**[6], or ETTR for short. It can give a better dynamic range in the image, and, hence, a higher image quality.

[6] https://en.wikipedia.org/wiki/Exposing_to_the_right

Shot of the week

Most of the insect shots I take are of stationary insects that sit on a leaf or flower. When I was sitting in my garden, this Humming-bird Hawk Moth showed up. It does not sit on flowers but hovers in the air while drinking nectar through its long tongue, like a hummingbird. But it changes position very quickly. Fortunately, I had my camera with me and, after a quick switch to a shutter speed of 1/2000 of a second, I managed to take this shot. Five seconds later the moth was gone, and I never saw it again. Always be prepared and have your camera in a mode to take quick shots.

Even with 1/2000 sec. shutter speed, the wings still show motion blur. But for a shot like this that is a good feature, as it suggests action. RF-S 18-150mm lens at 150mm, 1/2000 sec., F/6.7, ISO 2000.

Week 4: Using a flash

For insect photography you need a lot of light. It requires narrow apertures and fast shutter speeds, which are only possible when there is enough light. When the sun is shining and the insect is in the sun, there is ample light, but insects often hide in the shade. Sunlight can also result in harsh shadows. And when it is cloudy, which often happens in the Netherlands where I live, there is hardly enough light to take good insect shots. So, I decided to investigate using a flash.

Many photographers, including myself, are somewhat afraid of using a flash. It creates additional complications and adds extra settings to control. So, I was a bit reluctant to try this, but it turned out that using a flash for insect photography was easier than I thought, and it is strongly recommended.

To flash or not to flash

Photographing insects without a flash is of course possible. You will be limited by the amount of light that is available, which in turn puts restrictions on the exposure settings you can use. When you are using a tripod, the insect is sitting still, and there is no wind, you can use a slow shutter speed. But in most situations, you will have to use a higher ISO value, resulting in more noise. If the insect is large, you can use a wider aperture to compensate for the lack of light.

When using a flash, you always have enough light, so you can use the exposure settings you like. But the colors will change, and the background will become darker. In the following two images, a Burnished Brass butterfly was photographed without and with a flash. In this case I like the colors in the image without the flash more. But the darker background in the right image improves the composition.

Burnished Brass butterfly. The shot on the left was taken without a flash, with 1/350 sec., F/9.5, and ISO 1000. The shot on the right was taken with a flash, with 1/320 sec., F/13, and ISO 200.

Many macro photographers prefer natural ambient light. But insect photography is different. Because of their small size, the fact that they move around a lot, and the extremely small details you like to show, a flash often works better – if you use a good diffuser, as we describe below on page 29. Of course, this depends on the type of shot you want to take. When the insect is more of a prop

in a larger image, ambient light works better, as it lights the whole scene uniformly. Here are some advantages and disadvantages to using a flash.

Advantages

- More light, which means you can use a faster shutter speed, narrower aperture, and lower ISO value.
- Consistent lighting means you don't have to worry too much about exposure and can focus more on composition.
- No harsh shadows, caused by the sun. However, to avoid harsh shadows by the flash, you need a good diffuser.
- More separation between the insect and the background. Because the background is further away it becomes darker.

Disadvantages

- You need to carry extra equipment with you.
- The images can look a bit unnatural. For example, the colors might look different, and insects and leaves can become too shiny.
- You don't see the background anymore when it is far away.
- Parts of the image, like white flowers, might become overexposed.

After experimenting with insect photography with and without a flash I decided to use a flash most of the time. It is easier, and the resulting images are very good and detailed. Only when I want to show the insect in its larger environment, then I don't use the flash.

What type of flash to use?

There are basically three different types of flashes that you can use for insect photography:

- A normal flash on top of the camera, often called a **speedlight**. This is the cheapest solution. You don't need a strong one because the subject is very close. So it is also light. Without a good diffuser, a speedlight can give harsh shadows and unnatural lighting though.
- A **ring flash** around the front of the lens. This brings the light very close to the subject. Opinions about ring flashes are rather divided. Some people really like them, especially for the ease of use. Others consider the results unnatural because the subject is lit from all directions. This works well for product photography, but not for insects.
- A **twin flash**. These consist of two flashes that are either connected to the lens or extend from the flash unit with two flexible arms. They give good light but can be a bit clumsy to deal with. And they are considerably more expensive.

I decided to buy a simple Godox V350 speedlight flash that I can also use in other situations. It is not very strong, but that is no problem for insects, because these will be close to the flash. You can also go for the cheaper 350TT that is not rechargeable and uses batteries. The main reason for choosing the V350 is that it has a faster recharge time, which is important because you often want to take pictures in quick succession.

Exposure settings

Using a flash is something you must get used to. There are some new concepts to understand and some additional settings. It is important to avoid harsh light and shadows, so you need a diffuser to spread the light. It is also important that the lens not cast a shadow on the subject. Fortunately,

most speedlights are high enough and extend enough forward, so that is not a problem. But avoid using a lens hood.

A Gray Cross Spider, shot in the evening. 60 mm, 1/320 sec., F/13, ISO 200, flash.

The following flash settings are important:

- **Strength.** You can set the strength of the flash. Most flashes also have an automatic mode called TTL (through the lens), which measures the light and automatically determines the strength of the flash. I recommend using this.
- **Zoom.** Some flashes can zoom in when the lens does. Because I am going to use a diffuser, this is not desired. I set the zoom to manual at the widest value, which is 24 mm for my flash.
- **Flash exposure compensation.** When the flash strength is set to TTL, you can still adapt the flash power using the flash exposure compensation. Most insects have dark colors. By setting the flash exposure compensation to +1, the flash produces one stop extra light, making the insects less dark. This works well in most situations.

When you use TTL to set the flash strength automatically, it is essential that you manually set all the exposure settings for the camera. Otherwise, the camera will adapt the exposure based on the ambient light and does not take the flash into account. This includes shutter speed, aperture, and ISO. Do not use automatic ISO when using a flash! If you do, the camera will pick a large value that does not take the light from the flash into account. After some experimenting, I established the following exposure settings for the camera:

- **Shutter speed**. I use 1/320 of a second. On my camera, this is the fastest speed that still allows for synchronization with the flash. Check what the maximal synchronization speed for your camera is and use that. By using a fast speed, very little ambient light is used. Almost all light comes from the flash. If you want more ambient light (for example, to have a more visible background) you can use a slower speed, but I would not go below 1/125 of a second.

- **Aperture**. I use F/13 most of the time. This seems to be a reasonable compromise between depth of field and image quality. For a large depth of field, you need a high F-number. For the best image quality, you prefer to stay as close to F/8 as possible (depending on the lens).
- **ISO**. I use ISO 200. Normally ISO 100 gives the best image quality (depending on the sensor). But by increasing it to 200 I halve the amount of light required, which improves the recharge time of the flash. A higher ISO value will allow for more ambient light and a weaker flash.

To avoid having to change these settings each time you use the flash, you are recommended to use one of the custom modes of your camera for this. Most cameras have several custom modes you can configure. You select the custom mode to use with the same knob with which you select the normal modes, like aperture priority. They are often indicated with C1, C2, and C3. In that custom mode you can also indicate the desired settings for focusing. Once you have put all of this under a custom mode, you simply dial the mode switch to that mode, and you are ready to shoot the insects.

Using a diffuser

The spider in the image below was one of the first shots I took with the flash. It has rather harsh shadows caused by the flash. Normally you want to avoid that, but for spiders I like it. The shadows of the legs add some creepiness to the image.

A Huntsman Spider. 65 mm, 1/320 sec., F/13, ISO 200, flash.

To avoid harsh shadows, you need to use a diffuser. The flash comes with a plastic diffuser you can put on the flash, but this does not help much. It does not change the size of the light, and that determines how the shadows look. The plastic diffuser does help indoors because the light from the flash is reflected from the ceiling. But that does not work outside.

I recommend that you use a diffuser that fits around the lens (see the image below). These cost less than 10 euro on Amazon. Be careful though that the hole through which the lens goes is the correct size. Mine was too large so I had to add some rubber bands to keep it in place. The diffuser becomes a nice, large, soft light source. It is close to the insect and positioned above the insect like normal sunlight, which looks natural. It can be a bit clumsy to use though. Sometimes you start pushing

against branches that contain the insect, making it harder to focus. I was afraid it might scare insects away, but the opposite seems to be true. Your face seems to be scarier to them.

Camera with flash, and a diffuser around the lens.

To investigate the diffusers, I did some experiments. The following images show the results.

The effects of using the different diffusers. The top-left image uses the normal flash without diffuser, the top-right uses the plastic diffuser on the flash, the bottom-left uses the diffuser on the lens, and the bottom-right uses both diffusers.

You can see how the shadow changes from hard to very soft. The diffuser on the flash helps a bit, but this is mainly because I took these shots inside and hence, there is some reflection from the

ceiling. Outside, the diffuser on the flash will not help, and it will waste flash power. So better not use it. Your flash will recharge faster without it.

Comparing the top-left and bottom-left images in the figure above, you can see that the diffuser around the lens has a huge effect on the quality of the image. The diffuser turns a rather ugly image into a nice image. The remaining soft shadow is useful, as it adds some depth. This is why it works great for insect photography. It removes the hard shadows but still adds depth, which brings out the details better.

There are also more expensive, alternatives. For example, Pope Shield[7] makes diffusers that you screw into the filter thread of your lens. There are fixed ones and magnetic ones that you can easily add and remove. They are not too expensive, some 40 euros. The company though has a long delivery time of over four weeks. The result is slightly better than the lens diffuser, but they are clumsier to use and carry with you, as they do not fold up. I did not use them for the shots in this book, as I only got one after the book was finished.

Varying the settings

I take almost all my shots with the flash. In combination with the 1/320 sec. shutter speed, I don't have to worry about motion blur. Using F/13 the depth of field is large enough for most situations, leading to sharp images, and ISO 200 means that the image quality is excellent. I don't have to worry about exposure, so I can fully concentrate on composition and focus.

But sometimes it is good to change the settings or even not use a flash at all. Decreasing the **shutter speed** will bring in more ambient light and reduce the flash power. As a result, more of the background becomes visible. If the insect is in the sun, the soft shadows of the diffused flash will be replaced by the harsh shadows of the sun. The following images show this effect. The image at the left uses 1/320 sec., while the image at the right uses 1/45 sec.

Changing the **aperture** influences the depth of field and the relative amount of ambient light used. When closing the aperture, more of the insect becomes sharp. But at the same time, also more of the background and foreground becomes sharp. This is even more prominent when photographing small insects. The following images show the effect of changing the aperture from F/4 to F/32. This completely changes the image. Aperture is the most important parameter for insect photography.

[7] https://popeshield.com/


Changing the **ISO** has a similar effect to changing the shutter speed. More ambient light is used and less light from the flash. But the image will also become a bit noisier. The following images show the use of ISO 100 and ISO 1600. In the second image, the flash power is close to 0 and all the light is ambient light, leading to a harsh shadow from the sun and more shininess.


Interesting combinations

Certain combinations of settings lead to particular types of images. The settings influence the amount of ambient light that shows in the image, and the depth of field. But they also influence the colors and shadows. Here are some interesting combinations.

Focus on the insect. This is my default approach. For such shots, use a flash, fast shutter speed, narrow aperture, and low ISO. This makes the insect sharp and clearly visible, while the background becomes dark. In post-processing, you can enhance this effect further. In this image of a weevil, the insect is all that matters.

Insect in its surroundings. For these shots, use a narrow aperture, but still allow for a lot of ambient light. Preferably use no flash at all, or only a weak flash. You will have to use a slower shutter speed and higher ISO for this. This approach works best when the magnification is not too large and when there is enough ambient light. It requires taking a careful look at the background when taking the shots, because distractions, like ugly leaves, become very prominent. This Blue-winged Grasshopper lives in sandy areas, so it is important to show the sand.

Background for composition. For these shots, use a wider aperture and allow for enough ambient light, using a somewhat slower shutter speed or higher ISO. Still use a flash, but weaker. This will reduce the depth of field considerably. You see more of the out-of-focus background. The weaker flash still puts emphasis on the insect. Make sure you have the desired part of the insect in focus. Used correctly, the background will enhance the composition. In this image of a Common Darter dragonfly, you can still see the heath in the background. If you used a strong flash, the background would be completely black.

Further tips

Here are some further tips for when you are using a flash.

- Make sure your flash is always ready to fire. Flashes go into sleep mode after a while. Either turn this off, or regularly half-press the shutter to reactivate the flash. I have lost quite a few shots because the flash had to charge first. Also, only approach the insect when the flash is fully charged.
- I sometimes press my forehead against the back of the flash. This gives me more stability and helps me to focus. Be careful though, that you don't press buttons on the flash unit.
- Be careful with shiny leaves. They can give poor reflections of the light from the flash. When the leaves are wet, the effect is worse, although little water drops can also give a nice touch when using a flash. Try to use an angle such that there is no reflection back to the camera.
- The diffuser can be in the way when taking shots. Try to rotate the camera. You can always rotate the image back in post-processing if you want. Or take a bit more distance and crop the image later. You can also just rotate the diffuser to the side. The flash will be diffused less, but that is better than not taking the shot at all.

Shot of the week

I saw this bug during a little walk near my house, but I did not have my camera with me. So, by the time I got home I took my camera, jumped on my bike, and rode back in the hope the bug was still there. I was lucky. It was only after the first shot that I saw that the bug was sitting on its eggs, making it an even more interesting shot.

This bug is called a Parent Bug. These bugs brood their eggs and even stay with their young larvae. So, it was only logical that the insect was still there. She would not have moved anywhere. This is the task of the mother. The father dies soon after mating.

Lens at 70 mm, 1/320 sec., F/13, ISO 200, flash.

Week 5: It's all about focus

It's crucial that the insects you photograph are in focus. And achieving focus is not easy when shooting insects with a large magnification. In this week, we discuss focus in more detail, and investigate both autofocus and manual focus.

Autofocus

Modern cameras, like my Canon R7, have amazing autofocus capabilities. Older cameras have just a limited set of focus points, but modern cameras can focus on any point you like. Using spot autofocus, you can indicate very precisely what to focus on. When shooting handheld, it is impossible to keep the camera perfectly still. So, the distance between the camera and the insect is constantly changing, and the focus must constantly adapt to that. To maintain the focus, you must set the camera to continuous autofocus (called servo on Canon cameras). I recommend switching off subject tracking. If you enable that, the focus point can jump to places you don't want. Similarly, I do not use animal or eye tracking. I want to determine the focus point myself. My experience is that eye tracking does not work well on insects anyway.

For non-insect shots I normally use back-button autofocus, where you focus with a button on the back of the camera, rather than by half-pressing the shutter button. This is way more flexible and highly recommended in many situations, but not for insect photography. Because the camera moves all the time you must press the focus button constantly, which results in a less stable grip on the camera. And for insect photography, you always want to keep focusing till the moment you press the shutter button. So, there is no advantage in using back-button autofocus in this case. Also, keeping the shutter button half-pressed reduces the time to take the shot.

In combination with a modern lens, the autofocus on my camera is extremely fast, which is very important for insect shots. It easily keeps up with the motion of the camera. The image stabilization of the camera and the lens helps. Of course it is not fool-proof and occasionally focus is on the wrong position. So you should always take multiple shots.

If you want to focus on a point other than the center, you must shift the focus point. This is often the case when you photograph an insect from the side and want to focus on the eyes. Always first decide how you want to photograph the insect. Change the focus point accordingly and only then approach the subject. If you do it this way, taking the picture is considerably faster, and there is less chance that the insect flies away. But this strategy does not work well when the insect is moving around! In that case, I simply leave the focus point in the center and keep a bit more distance, such that I can crop the image to the desired composition afterwards.

A Red Bug. The bug must be in focus but is not in the center. So, you must move the focus point before taking the shot. 65 mm, 1/320 sec., F/13, ISO 320, flash.

It is hard to keep the focus point on the correct position on the insect (typically the eyes), especially when the insect is small, and you use a large magnification. Very small movements of the camera or insect move the focus point to the wrong position and, hence, the wrong position will be in focus. You need to be able to hold the camera still, at least for the short period in which you take the shot. This requires practice. See below for some tips.

One problem with autofocus is that the camera sometimes focuses on the background, rather than on the insect. This happens regularly when the insect is on a ledge or on some small leaf. If your lens has a focus delimiter, set it to the near range. That solves the problem most of the time. If it still does not work, focus on something else that is larger and is approximately at the same distance, release the shutter button, move back to the insect, and half-press the shutter button again. After doing that, most of the time, the focus will stay with the insect.

Manual focus

Most articles and videos on macro photography recommend using manual focus. In the past, at large magnification, the autofocus of cameras and lenses was not fast enough to keep up with camera movements. Also, the camera did not offer enough focus points. Autofocus simply did not work well. With modern equipment that is no longer an issue. But manual focus still has its uses. And many macro lenses do not support autofocus at all, so you are forced to use manual focus.

There are two techniques for manual focus. The first is to fix the frame you want to photograph. Next you turn the focus ring on the lens to get the subject in focus. This is impossible when shooting insects handheld. You are always moving the camera slightly and, hence, you change the focus. But it is the preferred way to work when using a tripod.

The second technique is to fix the focus distance, often close to the minimum focus distance of the lens. Next you slowly move the camera forward and backward until the correct position is in focus. This is rather easy. Press the camera against your face (use the viewfinder), and slowly bend your upper body forward and backward. Don't move your head or arms! Press the shutter button at the

correct moment. I normally do that during the motion. So, I do not stop the motion but simply continue it and press the button at the correct moment. (Or, better, just before it as it takes a fraction of a second to take the shot.) Note that the higher the magnification factor, the harder it becomes to focus manually. If this does not work, you can also shoot a burst of images while moving the camera forward and pick the one that is in focus. But you often cannot use flash with high-speed continuous shooting!

Manual focus support

Cameras have several features to assist in manual focus. Note that for DSLR cameras, such features only work when using Live View on the screen on the back, not the viewfinder.

- **Magnification.** You can magnify the image you see with a factor of typically 5 or 10. So you only see the part you want to get in focus. You can determine the magnified part of the image in advance. For me this technique does not work. You must hold the camera extremely steady because all motions are magnified as well. I can imagine it works great with a tripod but not when shooting handheld.
- **Focus peaking.** Focus peaking shows the pixels in the image where the camera determines that there is focus. These are typical places where there is a high contrast. Cameras use different techniques to determine those positions. The positions are colored red by default, but you can change the color for if you have a red insect. These positions move when you move the camera forward and backward. When they are at the correct position, take the shot. I always have focus peaking on.
- **Focus guide.** This is a Canon feature, and it works great. It shows the focus square, as if you are using autofocus, and when the position in the square is in focus, it turns green, again, like in autofocus. But what is even better, it shows three little arrows. The closer these arrows are to each other, the closer you are to the desired focus, and when they align focus is achieved. They even show whether you need to move closer to the subject or further away. I love this and use it all the time when working with manual focus. While you move your body you see the arrows moving together. You predict when they will meet and then press the shutter button. By clicking just before or just after the square turns green, you can adapt the focus depth. Success is almost guaranteed. (Well, you still need to take multiple images to be sure.) One problem with focus guide is that it only works on a lens that has electronic connections to the body. Since many macro lenses are fully manual lenses, focus guide does not work for them.

Holding the camera still

To focus on the desired position, you need the image in the viewfinder to move as little as possible. This is a big challenge and applies both to manual focus and autofocus. Here are some tips to achieve that.

- A camera and lens with image stabilization help a lot to keep the view stable. I always use image stabilization, even though I don't need it to avoid motion blur because I use a flash.
- The longer the focal length of the lens, the harder it is to keep the view still. Also, the larger the magnification, the harder this becomes. So, only use a long lens when you do not need a large magnification.
- Whenever possible, use the viewfinder and not the display on the back. Press your face against the camera and, if possible, against the flash.

- Hold the camera with two hands and press your arms against your body. Don't use your right index finger to hold the camera. Just let it float above the shutter button. Otherwise, you will move the camera the moment you press the shutter button.
- Have a stable stance, with your legs spread a bit and one foot a bit ahead of the other. Only bend your body to change the distance to the insect. Keep your arms and head still.
- When possible, try to find some place to rest the camera, or your arms or body. For example, lean against a tree. Being on your knees also creates stability (use kneepads).
- When there is wind, you can try to hold the branch or leaf that the insect is on. Hold it between your little finger and ring finger, and then put your thumb on the end of the lens. In this way, you can better control the distance between the subject and the lens.
- Don't hold your breath. Instead, exhale before you take the shot.
- For Canon cameras, you can indicate in the menu that the camera shows the focus point when previewing the image. This is very useful to see whether you hold the camera steady and focus on the intended spot.

Caterpillar of a Cinnabar Moth. 60 mm, 1/320 sec., F/13, ISO 200, flash. You need to focus on the head, which is not in the center of the image.

Depth of field

At any time, only positions at one depth are in perfect focus. Everything that is not at that depth is not perfectly in focus. However, positions at a slightly smaller or larger depth are still enough in focus that the viewer will not notice. the range behind the focus point is larger than the range in front of it. So, you'd better focus on a nearer point on the insect, rather than on a further point. The range of depth that is considered in focus by the viewers is called the depth of field. In the next chapter we will discuss depth of field in more detail on page 43. For now, it is enough to know that the depth of field is influenced by the magnification factor, the aperture, and the focal length of the lens.

For large magnifications, that we need for small insects, the depth of field becomes very shallow. So it is difficult to get the whole insect in focus. It helps to have a narrow aperture (I use F/13 most of the time), but that is often not enough.

A useful technique here is to make sure the whole insect is lying in a single plane. If you set the focus distance to that plane, the whole insect will be in focus. This normally means photographing the insect from the side or top and making sure the back of the insect is at the same distance from the lens as the front.

A shot of a bee (Andrena) from the front. Make sure the eyes are in focus. 70 mm, 1/320 sec., F/13, ISO 200, flash.

But when you shoot an insect at an angle, or from the front, it is impossible to get the whole insect in focus. And such angles often give the nicest images. This isn't necessarily an issue. Having only part of the insect in focus will guide the viewer to the important spot, as the image of the bee above shows. The wings and rear legs are not in focus, but the all-important eyes attract the viewer's attention. We will discuss camera positions and their effect on focus in week 8 on page 64.

Shot of the week

This image could be considered a failure. But I like it. Because the insect is out of focus it creates a bit of a mystery. The background adds to this, as it is rather unclear what you are looking at. You still see the structure of the fly though, which is important. Confusion is a strong mechanism to keep the viewer interested in a photo. And it is fun to sometimes go against the rules and create something unusual.

Lens at 70 mm, 1/320 sec., F/13, ISO 200, flash.

Week 6: Learning about macro photography

For effective insect photography, it helps to understand a bit of the theory behind macro photography. So, this week I decided to delve into this area, investigating magnification factors, focus distance, aperture, and depth of field.

Magnification factor

When you read about macro lenses, they always talk about the maximum magnification factor. A macro lens should officially have a maximum magnification of at least 1x1, though many don't. So, what does this mean, and how important is it?

Officially, the **magnification factor**, also called the **reproduction ratio**, is the ratio between the size of the subject you are photographing, and the size of its projection on the sensor. When these are the same, the magnification is 1 (also denoted as 1x1). When the projection is half the size, the magnification is 0.5 (or 1x2), and so on. The **maximum magnification factor** is the magnification that is achieved at the smallest distance at which the lens can focus. The larger the maximum magnification factor, the smaller the insects you can photograph, and the more detail will be visible in the resulting images.

These definitions stem from the time of analog photography. Analog cameras used film, where each frame had a width of 36 mm. With a magnification of 1, an insect of length 36 mm would exactly cover the frame from left to right. The size of the insect on the film was the same as in real life. A magnification of 2 would double the size on the film, so now an insect of 18 mm would cover the image, while a magnification of 0.5 would halve the size, so an insect of 72 mm would cover the image. Full-frame sensors have the same size as the old film frames, so the same rule applies. But what about APS-C sensors?

APS-C sensors have a smaller width of some 24 mm. They have a so-called **crop factor**, which indicates the size ratio between the sensor and a full-frame sensor. This is often 1.5. For Canon cameras it is 1.6. When your lens has a magnification of 1, the area that is projected on the sensor is just 24 mm in width. The rest is cropped away. So, the effective magnification becomes 1.5. The **effective magnification** is the crop factor times the magnification of the lens. With an APS-C sensor small insects will cover a larger portion of the sensor and more detail will be visible in the final image. This is the reason why APS-C sensors are so useful for insect photography. They give you "free" additional magnification.

The following table shows the effect of the magnification factor on the width of the area that is visible in the image, both for a full-frame sensor and for an APS-C sensor. For example, when you are using a standard lens with a maximum magnification factor of just 0.3, on a full-frame camera, the smallest area you can photograph has a width of 120 mm. On my Canon R7 this becomes 75 mm.

When you are using an extreme macro lens with a magnification of 2 (or 2x1), on full-frame cameras the visible width is 18 mm, while on APS-C cameras it gets down to 11 mm.

Magnification lens	Width on full-frame	Width on Canon APS-C
0.3	120 mm	75 mm
0.5	72 mm	45 mm
0.7	51 mm	32 mm
1	36 mm	22 mm
1.4	26 mm	16 mm
2	18 mm	11 mm

A Cabbage White butterfly. You don't need much magnification for shots like this, so a standard lens works fine. 150 mm, 1/320 sec., F/13, ISO 200, flash.

From the information above, you might conclude that an image taken with a 1x1 magnification lens on an APS-C camera will look the same as an image taken with a 1.6 magnification lens on a full-frame camera. They will cover the same area, but extra magnification has a different effect than cropping. Increasing the magnification will reduce the depth of field. Cropping does not change that. So, when using an APS-C camera you will get a larger depth of field, which is another advantage.

With the current pixel density of the sensors, you can easily crop further. For example, my Canon R7 has 32-megapixel resolution. When printing photos, the top print quality is 300 ppi (pixels per inch). If you want to print images in this quality at a size of 30x20 cm (12x8 inch), you need 12x8x300x300 = 8.640.000 pixels, which is slightly over 8 megapixels. When you want to display them on a 4K monitor, you also need just 8 megapixels. So, you can crop the image with a factor of 2. When using a 1x1 magnification lens, the effective magnification factor on my APS-C camera now becomes 1x1.6x2 = 3.2, and the image covers just 11 mm.

A normal, non-macro lens often still has a decent maximum magnification. My Canon RF-S 18–150 mm lens has a maximum magnification factor of 0.47 (at 50 mm focal length). With the APS-C sensor

and some digital crop, the effective magnification becomes greater than 1. So, if you allow for some cropping, you can use it for macro photography, as the images in this chapter show.

Minimum focus distance

The maximum magnification is achieved at the minimum focus distance. The **minimum focus distance** is the smallest distance to your insect at which you can still focus. For a zoom lens, this distance depends on the chosen focal length. For example, if I set my 18–150 mm lens to a focal length of 60 mm, the maximum magnification is about 0.4 and the corresponding minimum focus distance is 21 cm. When I set the focal length to 150 mm, the minimum focus distance becomes 45 cm. If I use my 100–400mm lens at 400mm, it becomes more than a meter.

A Dock Bug. This shot required a focus distance of 23 cm from the sensor, so, just 12 from the front of the lens. 65 mm, 1/320 sec., F/13, ISO 200, flash.

Note that this distance is measured from the sensor, not from the front of the lens. The minimal focus distance from the front of the lens is call the **working distance**. For insect photography, that is a much more important measure. For example, my 18–150 mm lens is 9 cm long and together with the depth of the camera body, the working distance at 60 mm focal length becomes just 10 cm. Such a small distance might scare the insects away and it can also hamper the amount of light falling on the subject. Best avoid using a lens hood. If you need to stay further away from your subject, you need a lens with a larger focal length. But a larger focal length will reduce the depth of field, which we will discuss next.

Depth of field

The **depth of field** of a lens at a certain magnification factor is the distance between the front and back of the area that has acceptably sharp focus. Only one distance is perfectly in focus, but there is a range around this distance that we still experience as being in focus. The formal definition of depth

of field[8] is rather complex, based on the concept of the circle of confusion[9], but for photography it is enough to know that this is the depth range people experience as being sharp.

A Crab Spider. Even at F/13 the depth of field is too small to have the whole body in focus. But for a head-on shot that is not important. 70 mm, 1/320 sec., F/13, ISO 200, flash.

The larger the magnification factor, the smaller the depth of field. The depth of field also strongly depends on the aperture. The narrower the aperture (higher F-number) the larger the depth of field. As an example, let us consider a typical 65 mm macro lens by Laowa.

Magnification	Depth of field at F/4	Depth of field at F/16
0.5	1 mm	4 mm
1	0.35 mm	1.4 mm
1.5	0.16 mm	0.64 mm
2	0.13 mm	0.52 mm

As you can see, these numbers are small, especially with a magnification larger than 1. Of course, you only need such high magnification when photographing very small insects, but still. Note that with aperture F/16, the depth of field is four times the size compared to F/4. This is not a coincidence. The depth of field increases linearly as the aperture increases. Doubling the aperture will double the depth of field.

Using an APS-C sensor instead of a full-frame sensor does not affect the depth of field because the image is simply cropped, but it does increase the effective magnification. In the example above, using an APS-C camera with 1x magnification will get a similarly sized image as using a full-frame camera with 1.5x magnification, but the depth of field is more than twice as large with the APS-C sensor!

[8] https://en.wikipedia.org/wiki/Depth_of_field
[9] https://en.wikipedia.org/wiki/Circle_of_confusion

The depth of field is also dependent on the focal length of the lens. The longer the focal length, the smaller the depth of field. For example, if you use the 100 mm macro lens by Laowa with 1x magnification, the depth of field becomes 0.25 mm for F/4 and 1 mm for F/16. So, you lose almost a third of the depth of field compared to the 65 mm lens.

Obtaining the largest depth of field is not always desirable. Sometimes a small depth of field can yield more interesting photos. It guides the viewer to look at exactly the area you want her to focus on. Often these are the eyes of the insect, but that is up to you as a photographer. In that case, use a wider aperture. A wider aperture often gives a nicer, blurrier background that makes the insect stand out more.

A technique to remedy the lack of depth of field is focus stacking. Here you take several images at slightly different focus distances and combine the parts that are in focus. Fortunately, modern cameras have some built-in support for this and there are lots of software tools for it. See week 16 on page 120 for more detailed information on focus stacking.

A Hoverfly on a thistle. Because the magnification is not very large, you can get the whole flower in focus. 70 mm, 1/320 sec., F/13, ISO 200, flash.

Summary

When photographing insects, the following concepts are important:

- The **maximum magnification factor** of your lens. Together with the crop of an APS-C sensor and a digital crop in post-processing, this determines the final size of the insect in the image.
- The **minimum focus distance** is the distance between the subject and the sensor where the maximum magnification is achieved. The **working distance** is the distance from the front of the lens to the subject and is considerably smaller.
- The **depth of field** indicates the depth range that is in considered in sharp focus. This strongly depends on the magnification factor of the lens and the aperture.
- The depth of field also depends on the sensor size and the focal length of the lens. The longer the lens, the smaller the depth of field.

Some important take-aways from this theory are:

- You don't need a special macro lens to get started. If you are using an APS-C camera with enough megapixels, a maximum magnification of 0.3 is perfectly fine.
- You need to get close to your subjects unless you are using a lens with a large focal length. I recommend using a lens with a focal length between 65 mm and 100 mm, to balance the optimal working distance with the best depth of field.
- The depth of field becomes very small when the magnification increases. So, precise focus is important. APS-C crop and digital crop do not influence the depth of field.
- For a large magnification, it is best to use a narrow aperture of F/11 or more to have enough depth of field. Because you also need a fast shutter speed, that means you need a lot of light. This is why I always use a flash.

Shot of the week

I took this shot of a Beautiful Demoiselle damselfly during a trip to Luxembourg. In the Netherlands, where I live, it is rare. It prefers clean streams and we do not have many of those. I had never seen one before. You can imagine that I was very excited when I spotted it, so I approached it a bit too enthusiastically, which is never good for insects. It was gone before I could take the shot.

After quite a bit of searching and some further disappointments I finally found one that was sitting still and did not seem to be bothered by me. So, I managed to approach him. With my lens at 150 mm focal length, I did not have to get too close, and took this shot from 60 cm distance.

Lens at 150 mm, 1/320 sec., F/13, ISO 200, flash.

Week 7: Extension tubes and close-up lenses

After photographing insects for six weeks, I wanted to photograph smaller insects in more detail. I could have bought a dedicated macro lens for this. But there are considerably cheaper solutions that turn a regular lens into a macro lens: extension tubes and close-up lenses. So, I decided to go that path first and bought both.

Extension tubes

Extension tubes are rings that you place between the lens and the camera body. They move the lens further away from the sensor. This increases the focal length of the lens and reduces the minimum focus distance. Because you can get closer to your subjects, the magnification increases. A downside is that you lose some light, but when using a flash this does not matter. Extension tubes do not have any glass. They are just hollow. So, they do not affect image quality.

Two extension tubes of 13 mm and 18 mm are placed between the camera and the lens.

You need to get the correct extension tubes for your camera mount. There are extension tubes with different lengths. I bought the MK-RF-AF1 tubes from Meike. You get two tubes for only 45 euro (from Amazon). One has a length of 13 mm, and the other is 18 mm long. You can stack them to get

an extension of 31 mm. Note that these are tubes with electronic contacts. The camera can still communicate with the lens. This is crucial for autofocus and for changing the aperture. You also have cheaper tubes without electronic contacts. Avoid these unless you use a fully manual lens! Look for tubes that have the label “automatic” or “autofocus” in the name or description.

There is one big downside to using extension tubes. With normal macro lenses you can focus up to infinity. When you use extension tubes you lose that possibility. Your maximum focus distance is severely reduced. So, you can only use them if you want to do macro and nothing else. If you want to take a shot at a larger distance, you must first remove the tubes. Adding and removing extension tubes is a bit of work, and you must be careful that you do not get any dust in your camera.

Using extension tubes

The extension tubes are tiny. It is hard to imagine that they have such a big impact. I put both on my camera and put the 18–150 mm lens in front of them. That all works very simply. When approaching the insects, you immediately realize that you can focus much more closely. With the extension tubes, the minimum focus distance decreases. This distance depends on the focal length. I used to shoot with a focal length of 60 mm, but this made the focus distance too small. The insects almost had to get inside my lens and the light from the flash no longer reached them. But for a focal length of 70 mm or more it worked fine.

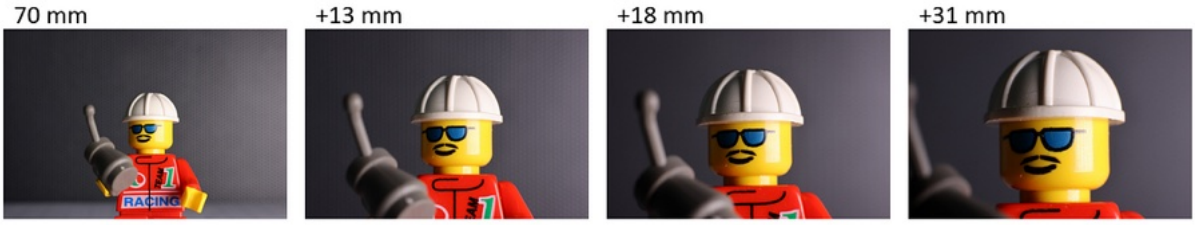
With extension tubes, the details became considerably better. I could now photograph small ants and little spiders. I started to look for tiny insects that up to now I had skipped because they were too small. With the extension tubes, you can make the insects at least twice as large (in width and height; four times if you look at the area). That makes a huge difference.

A Dead-nettle Leaf Beetle. I used my lens at 70 mm with 31 mm of extension tubes. 1/320 sec., F/13, ISO 200, flash.

There was also a downside. Focusing got considerably harder. The depth of field is smaller, and a slight movement of the camera changes the focus point. Autofocus did help here and still worked without a problem. Photographing at such large magnifications was more of a challenge, but also way more fun, and the resulting images were clearly more impressive.

Magnification

So, what magnification do you get when using extension tubes? This depends on the focal length of the lens and the length of the tubes. The following images show the result of using the extension tubes on my RF-S 18–150 mm lens at 70 mm focal length. From left to right you see the largest magnification possible without extension tubes, with the 13 mm extension, the 18 mm extension, and finally the right-most image was taken with both, so 31 mm. For reference, the head of the man, including helmet and neck, is only 14 mm high. The rightmost image has the largest magnification and shows an area of 27x18 mm. That is an effective magnification factor of close to 1.4 (on APS-C).



When using a zoom lens, it does not make much sense to use the extension tubes separately. The range in focal lengths provided by the zoom give you enough flexibility in magnification. Changing the focal length is considerably easier than adding or removing an extension tube. So, I decided to always use the two tubes together.

Theoretically you can calculate the maximal magnification factor as follows. Let L be the length of the extension tube, F the focal length of the lens, and M the maximum magnification factor of the lens without extension tubes. Then the new magnification factor of the lens becomes M + L/F.

An example will help. If the magnification of the lens is 0.35, the extension is 31 mm, and the focal length of the lens is 70 mm, the theoretical new magnification become 0.35 + 31/70, which is 0.79. Note that this is for a full-frame camera. For an APS-C camera we must multiply the result by 1.6, so the effective magnification becomes 1.26. For a focal length of 100 mm, the theoretical maximum magnification becomes 0.66, which is effectively 1.09 on APS-C. So, the smaller the focal length of your lens, the larger the magnification.

The measured magnification for my lens was even better. At 70 mm, the combined extension tubes achieved an effective magnification of 1.38. Using both extension tubes, my kit lens became a strong macro lens. On other lenses the numbers might be somewhat different, but in general, using extension tubes works great on lenses up to 100 mm focal length. With longer lenses the effect becomes smaller.

Working distance

The minimum focus distance at which such high magnifications are achieved is rather small. Because the lens, with the extension tubes, is long, the working distance, which is the distance between the front of the lens and the subject, is quite small.

The maximum effective magnification of 1.38 at a focal length of 70 mm resulted in a working distance of only 3 centimeters. This may sound impossibly small, but it does still work. If an insect is not moving, it does not really matter whether you are at 3 cm or 10 cm away. And with the diffuser, the light from the flash does reach the insect already at 3 cm. When you go to 100 mm, the working distance increases to 7 cm, which is clearly more comfortable, and it still results in an effective magnification larger than 1.

A Six-spot Burnet, shot with 150 mm focal length. Extension tubes were not necessary for this shot, but I did not have to take them off either. 150 mm with 31 mm tubes. 1/320 sec., F/13, ISO 200, flash.

Focus range

Some insects are small while others, like butterflies, are considerably larger. Also, sometimes you want the insect to fill the entire frame, while in other situations you want to show more of the environment. To achieve this, you must vary the magnification and, hence, the focus distance to the insect.

When using extension tubes, there is a limit on how far away you can get from the subject. It is impossible to photograph something that is big, so you lose some flexibility. Using a zoom lens helps because you can increase the focal length to increase your distance to the insect. On my 18-150 mm lens this gave enough flexibility to photograph all insects I wanted. At the highest magnification (at 70 mm) an insect of 2.5 cm fills the entire frame from left to right. At the lowest magnification (at 150 mm) I can photograph an area 10 cm wide. That range is enough for most shots, so I can leave the extension tubes on all the time.

You are strongly advised to do your own calculations for your own lens and extension tubes. Just aim your camera at a ruler and use manual focus to see what the largest and smallest magnification is for different focal lengths. You do not even have to take the actual shots. This information will be very valuable when you use the lens with the extension tubes out in the field.

Close-up lenses

Instead of extension tubes, you can also use a close-up lens. A close-up lens is a magnifying glass that you put in front of your lens using the filter thread. You can buy very cheap ones but those will have a negative impact on the image quality. You are recommended to get a more expensive one that has better quality. I decided to use the popular Raynox DCR-250. It cost around 70 euro. A big advantage of this close-up lens is that it clicks on the front of the lens, like a lens cover. You can quickly add or remove it.

The Raynox DCR-250 close-up lens attached to my normal lens.

Close-up lenses work completely differently than extension tubes. They are magnifying glasses that reduce the size of the area that the camera records. You can get them in different strengths. While extension tubes work best with a small focal length, close-up lenses work best with a larger focal length. If you use a zoom lens, use the maximum zoom to achieve the maximum magnification.

Close-up lenses restrict the working distance even more than extension tubes. With the Raynox DCR-250 on my lens, I can only focus between 5 and 11 cm from the front of the lens. The maximum magnification is sometimes reached at the minimum distance and sometimes at the maximum distance, depending on the lens and focal length, which is somewhat confusing.

A German Wasp. Shot with my lens at 140 mm using the Raynox DCR-250 close-up lens. 1/180 sec., F/13, ISO 200, flash. Notice the small depth of field.

Focusing with the Raynox is harder than with extension tubes, at the same magnification. This applies to both manual focus and autofocus. I think this relates to the much smaller focus range and the fact that for certain focal lengths, the magnification increases when the distance increases, which is counter-intuitive and might confuse the autofocus system.

Magnification

For my lens, the close-up lens reached the maximum magnification at 150 mm focal length and focusing as far away as possible. The effective magnification factor at this point became 1.89, compared to 1.38 when using extension tubes. The working distance was 11 cm, which works very well.

However, the smallest effective magnification you can achieve with this close-up lens is 0.9. The largest area you can photograph is just 4 cm. That is way too small for many insect shots. So, you must constantly add and remove the close-up lens, depending on the shot you want to take. Fortunately, this is very easy with the Raynox DCR-250. (Other close-up lenses you screw into the filter thread, so adding and removing them is more work.)

Again, these numbers can be rather different for your lens. Best do some experiments to understand exactly how your lens behaves.

To see the effects of the close-up lens, in comparison with the extension tubes, I shot the same flower in four different ways. In the top-left image I just used the lens. In the top-right image I used the combined 31 mm of extension tubes. The bottom-left image used the Raynox DCR-250, and the bottom-right image combines the close-up lens with the extension tubes. In each situation the maximum possible magnification was used.

As you can see, the Raynox gives a larger magnification than the extension tubes, and together the magnification increases even further. However, as expected, the depth of field is reduced considerably when the magnification increases.

Combining them

You can use the extension tubes in combination with the close-up lens. This increases the maximum magnification. With my lens, I can reach an effective magnification factor of 2.12 (at a focal length of 150 mm). There are situations in which this is useful. If you normally use extension tubes but sometimes need even more magnification, you can simply click on the Raynox and get the extra magnification for that shot.

For example, the image below shows the nymph (offspring) of a Green Shieldbug measuring less than 1 cm. It was shot using both the extension tubes and the Raynox to get the maximum magnification. Note the shallow depth of field though. An alternative way to get the same image would have been to only use the extension tubes and apply a digital crop in post-processing. This would have resulted in a larger depth of field, be it with a lower resolution, and it might have been the better choice.

The nymph of a Green Shieldbug. Shot with 31 mm of extension tubes and the Raynox DCR-250. 150 mm, 1/180 sec., F/13, ISO 200, flash.

Extension tubes or close-up lenses?

So, what are the advantages and disadvantages of the two approaches?

- **Magnification**. This is good for both approaches. The Raynox gives a slightly larger magnification than extension tubes (1.89 vs. 1.38 on my lens). This could also be achieved by using some longer extension tubes.
- **Minimum focus distance**. For the Raynox, the minimum focus distance at high magnifications is larger than for the extension tubes (11 cm vs. 3 cm at highest magnification).
- **Flexibility**. When using a zoom lens, the extension tubes give the most flexibility. You can go from a magnification of 0.35 all the way up to 1.38 on my lens. So, you can capture both large and small insects. For the Raynox, the range is much smaller, which means that it is impossible to photograph larger insects without removing it.
- **Ease of use.** You can easily add or remove the Raynox. It simply clicks on the lens. Removing extension tubes is more work.
- **Focus.** Focusing is easier with the extension tubes. Also, the depth of field seems to be larger with the extension tubes.
- **Price**. Both are rather cheap. The extension tubes were 45 euro on Amazon and the Raynox DCR-250 was 70 euro. So, tubes are cheaper.

A Black-headed Ash Sawfly. Shot with 31 mm of extension tubes and the Raynox DCR-250. 150 mm, 1/320 sec., F/13, ISO 100, flash.

So, should you use extension tubes or the Raynox? I think the Raynox is great if you incidentally need more magnification. It is easy and fast to click on the lens. You can also use it on cameras with fixed lenses if they have a filter thread.

For continuous extra magnification, extension tubes are the better choice. You have a larger focus range and autofocus works better. Here are some use cases:

- **Macro lens**. If you have a good macro lens, using extension tubes does not make much sense. The Raynox helps to get an extra push in magnification when needed.
- **Normal lens for macro.** If you use a normal (zoom) lens, I recommend using extension tubes if you go out to shoot insects or macro. You can still combine it with the Raynox for extra magnification when required.
- **Casual photography**. If you are shooting all sorts of stuff (not just macro) but occasionally want to take a macro shot, extension tubes are a hassle. In this case the Raynox can be handy.
- **Controlled environment**. If you photograph insects in a controlled environment, like indoors, with a tripod and possibly a focus rail, you can use both together to get the most magnification.

For me, extension tubes are easier to work with and from this moment on I will use them for almost all my shots. When I go out shooting insects, I take no other shots, so I never have a reason to change lenses. I use both tubes stacked together because that gives the largest magnification. I do take the Raynox with me and add it in those situations where I need extra magnification.

Shot of the week

This shot of a tiny white, almost translucent insect caused a lot of mystery. I had no idea what it was, so I posted the image on a Dutch Facebook group on insects. There was a lot of discussion and many different suggestions about what it could be. Finally, people decided that it was not an insect at all. Insects change their outer skin several times when they grow into adults. This was a beautifully preserved left-over skin of one of those insects. It is amazing how much detail it contains, so I really like the shot.

Lens at 70 mm with 31 mm of extension tubes, 1/320 sec., F/13, ISO 200, flash.

Week 8: Composition

Composition is an important topic in photography and many books have been written about it. When the composition of a picture is good, it keeps the attention of the viewer for a longer time. But what about composition for insect photography?

Composition deals with how the elements work together to make up the total image. This includes my different aspects. Where and how are the elements positioned, how do lines produce flow, and how to create visual balance? And, obviously, we want to avoid distractions. Good composition helps to grab and keep the viewer's attention and makes her focus on the important aspects. Skillful composition makes the photo more interesting to look at.

When photographing insects, initially I was happy when the insect was visible in the image, and it was sort of sharp. But soon I started looking at other aspects. How is the insect positioned? Is it a top-down shot, side shot, or a shot from the front? Is the insect looking into the camera? If not, what is it looking at? Which parts are in focus? Asking these questions and making deliberate choices considerably improves your composition.

As a next step you must pay attention to the background. Does it make the insect stand out? Does it contain annoying distractions? Does it lead the eye of the viewer to the important part of the image?

A ladybug. The stem in this image forms a flow, suggesting that the ladybug is climbing upwards. 70 mm + 31 mm tubes, 1/320 sec., F/16, ISO 400, flash.

Getting attention

When you create an image, your goal is to attract the viewers' attention. This is normally rather easy with insect pictures. Insects at high magnification look fascinating, sometimes even frightening, and always interesting. Because of all the detail, the picture holds the attention of the viewer for quite a while. The viewer sees things she never thought existed.

Try to make the image raise questions in the viewers' mind. What is the insect looking at? Is he going to climb the stem? Is he going to jump or fly away? When you manage to create some confusion, this also keeps the attention. For example, in the image above the stem looks like an iron bar. That is not what the viewer expects and, hence, she is confused.

Where is this fly? Are these leaves? (They are flower petals.) The background creates some confusion, which is good to grab the attention of the viewer. 70 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

The position of the insect in the frame

There is the famous composition "rule of thirds".[10] If you divide the image horizontally and vertically in three equal parts, the four positions where the lines intersect are the best positions to place the main point of interest. When the insect covers just a small portion of the image, this is easy to achieve, but it is much harder in other situations.

Often the eyes should form the focus. (Especially for spiders that have so many of them.) Many insects are elongated, and the head is on one side. If you want to keep the entire insect, or a large portion of it, in the image and place the eyes on one of the four positions, either the head is close to the border of the image or there is a large open space in front of the head. In some situations this can work, like in the image below of the head of a butterfly. The large antennae fill the empty space and guide the viewer to the head. But often it won't lead to a nice composition, and you better break the rule of thirds and place the eyes in the center of the image. You can though try to put the eyes close to the bottom third or top third of the image.

[10] https://en.wikipedia.org/wiki/Rule_of_thirds

Closeup of the head of a Red Admiral butterfly. The head follows the rule of thirds. The antennae and leg lead the viewer to the head. 70 mm + 31 mm tubes, 1/320 sec., F/13, ISO 400, flash.

Suggesting action

By positioning and orienting your insect you can suggest action. Action makes the picture more interesting. Of course, the insect might not collaborate. So, I tend to spend a lot of time with each insect, taking shots from different directions and hoping that it moves somewhere interesting.

This Red Soldier Beetle is ready to attack you. The image positions the insect looking down into the camera, follows the rule of thirds vertically, and suggests action. 60 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

When an insect is at the edge of a leaf or a flower, you suggest it will jump off or fly away. If it's on a slanted stem, you suggest it will climb upwards. If it's looking at something food-like, it might want to eat it. And so on. In the image above of a Red Soldier Beetle, it looks like he is coming for you.

Lines

Lines and curves in pictures are powerful. They provide flow and guide the view of the observer. Lines can be vague in the background, or prominent in the foreground. Be careful though that they don't confuse the viewer.

Rotate your camera or rotate the image in post-processing to get the lines in the desired direction. It often works best if they emanate from a corner of the image. The stem in the ladybug image at the start of this chapter was almost horizontal in the original shot, but I felt that a sloping path was more interesting to the composition, so I introduced a rotation in the frame to create a more interesting picture.

Negative space

Negative space refers to areas of the image that at largely empty. Those areas provide breathing room and draw attention to the main subject. If you look at the various shots in this chapter, and elsewhere in this book, you often see large negative spaces. For example, in the image of the grasshopper below, the right half is negative space. And in the image of the butterfly above, the left half is negative space.

This image of a Speckled Bush-cricket has a lot of negative space. 150 mm + 31 mm tubes, 1/180 sec., F/13, ISO 400, flash.

Negative space can often be achieved by taking shots from the side or from the front of the insect. Best take a low viewpoint. For top-down shots, negative space is much harder to achieve unless the insect is sitting on a stem or near to the edge of a leaf or flower. Using a flash helps because the background becomes darker and, hence, emptier. If you don't use a flash, pick an aperture that makes the background blurry.

If it is not possible to create negative space while taking the shot, you might be able to provide it in post-processing by darkening or blurring parts of the image.

Symmetry

Symmetry can make images very appealing. And insects are good subjects for this. An insect normally has a plane of symmetry that goes through the middle of his body from the head to the tail. When the insect is sitting straight, one side of the plane is largely a mirrored copy of the other side, although legs, antennae, and wings might be in different orientations.

You can exploit this symmetry in your images by placing the camera on this plane of symmetry and directing it along this plane. This is typically the case when you take a top-down shot or when you take a shot from the front or back. A particularly interesting symmetrical shot is a head-on close-up shot of an insect, like in the following image of a moth.

A head-on, close-up shot of a Large Wainscot moth. The image is almost symmetrical because the front legs and antennae are almost mirrored copies. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

It is important that the background is blurred, or that there is some element of symmetry in there as well. And watch out for the shadows. When you have strong shadows in your image in one direction, they destroy the feeling of symmetry. When using a diffused flash this is not a problem.

In the image, you'd best place the axis of symmetry exactly vertical and in the middle. This is often hard to do while taking the shot, but you can easily rotate and shift the image in post-processing. While taking the shot, leave enough room around the insect to have space to manipulate it afterwards.

Dealing with the background

Initially, I was so focused on the insects that I forgot about the background, but the background plays a crucial role in framing the insect. It should make the insect pop, and it should not contain annoying distractions. Small distractions can be removed in post-processing, but large distractions are hard to get rid of.

The blurriness of the background is an important aspect here. This can be achieved by using a wider aperture, but that reduces the depth of field. You must experiment to determine the best balance between blurriness and depth of field. You can of course apply blur in post-processing, but this is complicated and requires careful masking. Using a flash helps because it will make the background darker.

In the best shots, the background supports the foreground. For example, there can be subtle lines that draw attention to the insect, or the background can frame the insect by following its contours. This is hard to achieve. You have little control over the surroundings of the insect. However, always experiment with changing the direction of your shots to see what it does to the background.

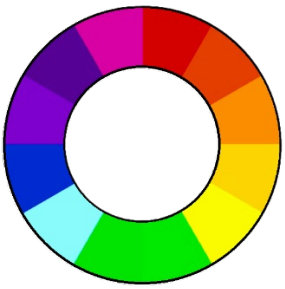
Green-veined white butterfly against a dark background to accentuate the wings. Note that the dark leaves in the background sort of follow the shape of the wings. 150 mm + 31 mm tubes, 1/320 sec., F/13, ISO 400, flash.

When viewing an image, your eyes wander around the image, in the end resting on the most important part. The background should stimulate this movement. In the image above, the leaves and flowers are all elements that draw the attention to the different corners of the frame, allowing the viewer to spend more time looking at the image.

Color

Color plays an important role in composition. Many insects are colorful, so it helps to know how color influences the appreciation of images. Certain colors attract more attention than others. This is called the **visual weight** of the colors. Colors like red and orange have a much heavier visual weight than green or blue.

Colors are often displayed on a color wheel, like the image below. In the color wheel, contrasting colors are on opposite sides, while similar colors are neighboring.



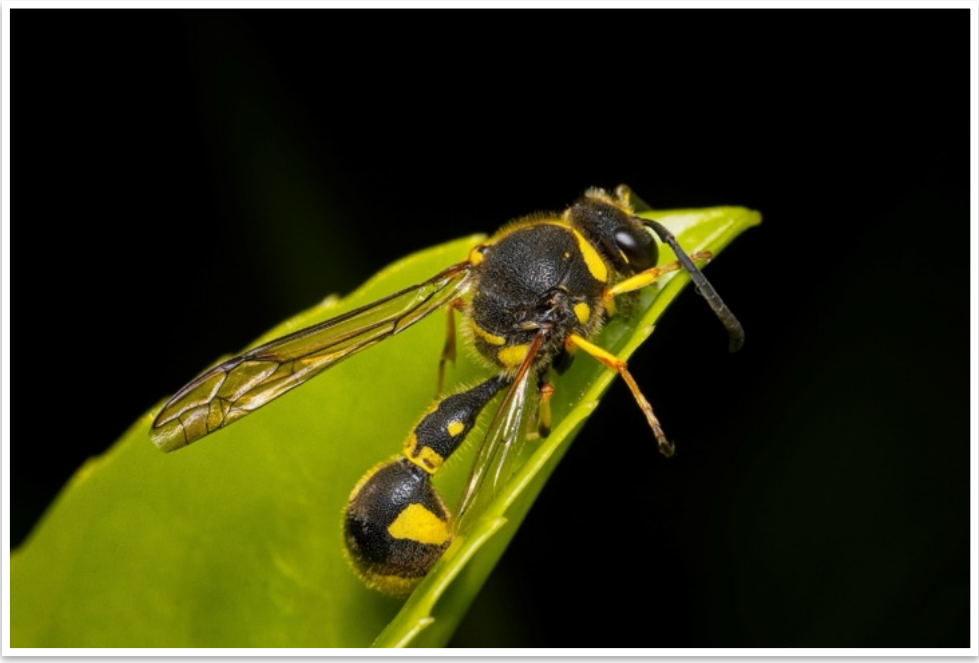
In a picture you can strive for **harmonious colors** that are neighbors on the color wheel. This creates order and is calming. Alternatively, you can try to get **complementary colors** by combining colors on opposite sides of the color wheel, which creates more visual interest in the image. For insects, complementary colors often work well, because they make the insect more prominent. But it is not easy to achieve this. The insect is sitting in its natural environment, and you have little control over it. But, for example, it is often nicer to photograph a green bug on a brown leaf, rather than on a green leaf.

Sometimes it helps to create an artificial background. For example, you can hold a colored card behind the insect, or you can try to place the insect on a colored surface. This clearly is not the natural environment for the insect, but it can give much nicer colors and put more emphasis on the insect. It can also remove distractions. For example, for the following image of a jumping spider I caught the spider on a blue tray. This allowed me to perfectly position the shot, but also, the blue color contrasts nicely with the yellow pedipalps and legs. All focus is on the spider.

A jumping spider. By placing it on a blue tray, the yellow colors of the pedipalps are more prominent, and the background does not contain any distractions. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Positioning the camera

You can shoot insects from many different angles: from above, the side, the front, and so on. Positioning the camera at the best angle with respect to the insect is important, but it is also difficult, due to the constrained environment and unwilling subjects. The position of the camera has profound effects on the way the viewer experiences the photo, and it also leads to technical issues related to depth of field.



An Eumenes wasp. In this rare case I like a shot slightly from behind as it shows the amazing connection between the front and the rear part of the body. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Top-down

When you look at insect images posted on the web, most of the shots are from above, looking down on the insect, sometimes at an angle. Often, the angle is from behind, which normally does not make for a nice shot, but is sometimes unavoidable because the insect turns away from you. And sometimes you must break the rules to get the best shot, like in the image above, where there is a reason to show the insect from the back.

Many easy-to-spot insects sit in bushes below you, so a top-down shot is the easiest to take. It can be nice when the insect has an interesting back pattern, like many plant bugs or butterflies. It is also good for identification. But I take very few of these top-down shots because I think they are kind of boring.

Top-down shots are the easiest when trying to focus. The whole insect is on the same depth plane, and you only need to get a relatively shallow depth of field, compared to compositions at an angle which require a deeper field. From the top down, focusing on any part of the body will work, but you must make sure you are indeed straight above the insect.

An Oak Beauty moth. Because of the top-down shot the whole moth is in focus and you can see all the intricate details in the wings. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

From the side

To take a shot from the side, you must ideally be at the same height as the insect. I normally wear knee pads when photographing insects. It looks a bit silly, but it works great. You can now easily kneel for all these lower shots, without getting hurt or getting your pants dirty or wet. It is so much more comfortable. And on your knees, you are much more stable, which helps in taking the shots.

A shot from the side shows the insects in a lot more detail. You can see the legs, the antennae and, most importantly, an eye. Focus on the eye. If the eye is not in focus, the image will not work. Because the viewer is on the same level as the insect, there is more of a connection. The viewer is part of the scene, not just an observer.

With side shots, you can get the whole insect in focus because it sits on the same depth plane. You do though need a bit more focus depth because the legs and antennae will stick out of that plane. But you do not always need to get the insect fully in focus.

When the insect is sitting on a ledge, like the moth in the image below, you can also separate him better from the background. The background will be blurrier, and when using a flash, it also becomes darker.

I like these shots, although I often take a slightly higher point of view to also show a bit of the back of the insect. That adds more depth to the image.

A side shot of a Dark Strawberry Tortrix. 85 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

At an angle

Rather than putting the whole insect on the same plane, either top-down or from the side, you can also try to photograph it at an angle. I sometimes photograph the insect at an angle of some 45 degrees from the front and a bit from above. This gives a nice overview of the whole insect and puts some emphasis on the head.

European hornet, shot at a 45-degree angle. The face shows nicely, while you still get an overview of the whole insect. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

With this type of shot, it is almost impossible to get the whole insect in focus, especially when it is small, and you need a large magnification. Also, it does not work well with long antennae or legs.

The hornet in the image above is large (it is the biggest wasp in the Netherlands), so you don't need much magnification. It has only small antennae and legs, so you can get most of it in focus.

From the front

When you take a shot straight from the front of the insect, this has a strong effect on the viewer. You feel looked at. And when the insect is a bit creepy, this emphasizes that effect.

Two mating hoverflies. Using a shot from the front, all the focus is on the eyes and the rest is left to the imagination of the viewer. 80 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

With front shots, you lose information about the global shape of the insect. They are difficult to recognize because, the closer you get to a full-frontal photo, the more of the body is hidden by the head and more of it is out of focus. But recognition is obviously not the point of such an image. Focus becomes a serious issue, especially when you want to do a close-up shot. As always, focus on the eyes.

Comparing camera angles

To see the effect of photographing from different camera angles, here are three pictures of a weevil of the genus Curculio, taken from three different directions.

Three images of the same weevil, to show the effect of changing the angle. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

- The first shot is taken from the side (slightly from behind) and at a 45-degree angle from the top. Because insects tend to turn away from you, you have no other choice, unless you are very fast. This type of shot works well for identification. It is easy to get the full insect in focus. because the whole insect lies on the same depth plane.
- The second shot is at an angle from the front. This increases the involvement of the viewer. The insect is coming towards you. You still get a good overview of the total insect. Total focus is still possible but harder to achieve. In this image, it also helps that the snout with the antennae is sticking out over the edge of the leaf, making it more visible. There is a lot of negative space at the right side of the image.
- The third shot is directly from the front. This is the most exciting. The insect is looking you straight in the eyes. But the global shape of the insect is lost. It is no longer possible to get the full insect in focus. In particular, the interesting antennae are no longer clearly visible.

I normally prefer the second type of shots that are taken at an angle from the front, although I might have taken a slightly lower point of view if I would have been able to. I do though also take a shot from above for identification, if possible, but this is all a matter of taste.

Shot of the week

The Mother of Pearl is one of the many moths that is active during the day. It rests in a beautiful way with its four wings spread open. But these moths have one nasty habit. They always sit at the bottom of leaves. They clearly prefer the dark side. When I first saw a few of them, it took ages before I found one on a flower in a way in which I could photograph it nicely. You sometimes need a lot of patience. Of course, a couple of days later I came to another spot with the same moths. There were lots of them, and they sat down very close to me, showing all their beauty. I could approach them up to a few centimeters without them flying away. Still, this earlier shot was the nicest I think, with his head tilted slightly to the side.

Lens at 100 mm, 1/320 sec., F/13, ISO 200, flash.

Week 9: Improving the images

Post-processing of insect shots can help improve their quality. You can use the JPG images that the camera produces, but your images will be considerably better when shooting in RAW format and using some post-processing software to improve them. I always shoot in RAW. This week I delve into the process I use to create my final images.

Many photographers are not fond of post-processing their images. They don't want to spend the time behind the computer and prefer to go out and take more shots instead. They simply use the JPG images that their camera produces. But investing a bit of time in improving your images can make a huge difference. A few minutes can turn a good image into a great image, and it is not complicated at all.

When photographing insects, it is almost impossible to take the perfect shot. You have limited control over the lighting, you have limited control over the framing (due to the focus distance and all the branches and leaves), you have no control over the movement of the insect, and you often have very little time to take the shot. So, post-processing is almost unavoidable if you want to create a good final image.

To process or not to process

There is a lot of discussion on the web about whether it is "fair" to post-process your images. My view is that it entirely depends on what you want to achieve. If you are creating a work of art, anything goes. If you want to record the real world, you should restrict yourself.

Realize though that every image is "processed". If you use JPG images, the camera will process the image. A flash changes the light and, hence, influences how the image looks. The lens will change the image, and so on. Also, when you print an image, it is processed again. And even the graphics card and monitor you use to view the image applies some image processing.

My opinion is that processing is acceptable if you could also have seen the resulting image in real life. So, things like changing the composition and the lighting are fine. Also sharpening the image is ok, as you are correcting errors in the lens or in focusing. Even removing some small distraction is no problem for me. But I will not change the colors of an insect, change the size, or replace the background, unless creativity is the explicit goal. But this is just my view, and you are welcome to take a different stance.

Why post-processing?

There are several reasons to process your images.

Increase the magnification

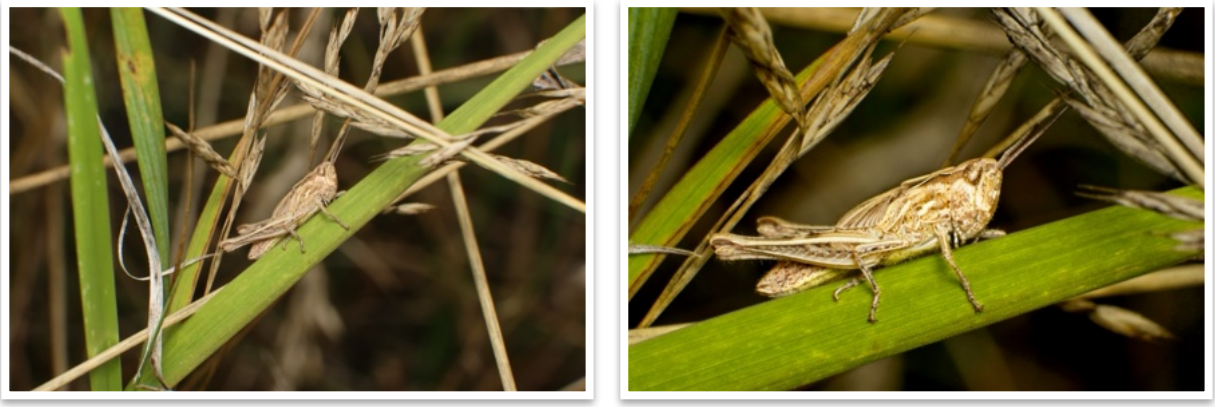
Even with a good macro lens, it is often impossible to get close enough to insects to fill the entire frame. Fortunately, most cameras produce images of at least 24 megapixels. You don't need that many pixels, so you can digitally crop the image to enlarge the insect in the frame. My camera produces images with 32 MP. 8 MP is enough for most purposes, so I can crop the image by a factor 2 in each direction.

Increasing the magnification of a beetle, called a Notoxus monoceros (monoceros mean unicorn), using cropping. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Digital crop has some advantages over using larger magnification. It is easier to take a good shot with less magnification. And the depth of field increases, so a larger part of the insect will be in focus. For all but the largest insects I normally use some crop to increase magnification.

Improving composition

It is impossible to get a perfect composition when photographing insects. You do not have the time to position yourself in the best possible place, and there are often leaves and branches that are in the way. I normally keep a bit of extra space around the insect to determine the best composition in post-processing. Rotating the image can also improve composition. Because there is hardly ever a horizon in the image, you can usually rotate without a problem. Only take care that shadows are in the correct direction. Shadows that appear above the insect look weird. When using a flash, you normally do not have that problem.



By cropping and rotating the image you lose distractions and improve composition. The grasshopper is framed by a triangle of grasses. 100 mm, 1/320 sec., F/13, ISO 200, flash.

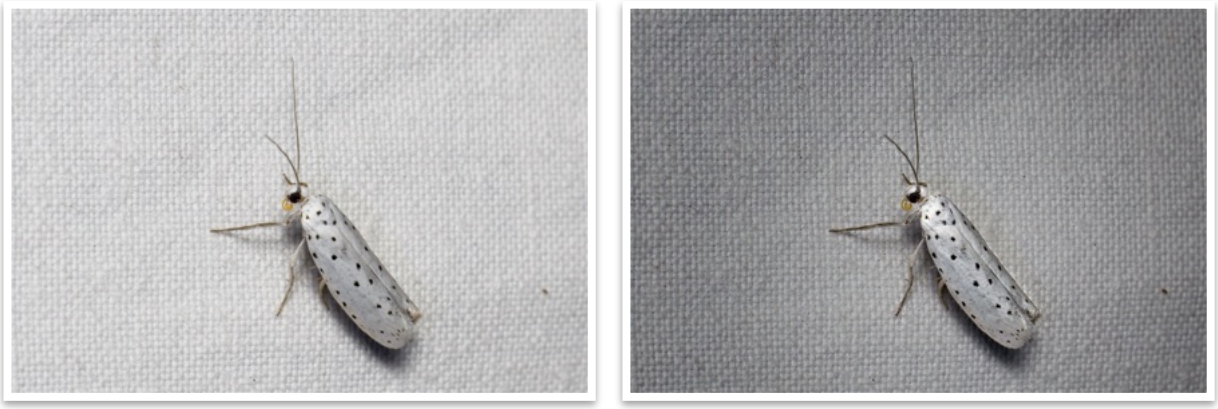
Improve image quality

When you use RAW images, you must apply some image improvement techniques. You can adapt the white balance, change the exposure, and enhance or reduce the colors. This is normally called developing the image. You can also apply sharpening and/or noise reduction to improve the shot. Modern post-processing software has AI-based tools for this, which makes this process largely automatic. But you should, of course, adapt it to you own style.

Sharpening, noise reduction, and adapting the exposure and color of this China Mark Moth improved the quality. 60 mm, 1/125 sec., F/16, ISO 2500.

Put focus on the subject

In the image, the insect should draw the attention of the viewer. But often this is not the case. The background is too distracting or too bright, there are other elements in the scene, the tone of the insect is too dark (for example against a white flower), and so on. In post-processing you can remove distraction, change the color and saturation of the background, blur or darken parts, increase the dynamic contrast or vibrance of the insect, and so on.



In the original image the white background dominates the Ermine moth. In post-processing I made the background darker and the moth lighter, to place more focus on the moth. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Other uses

There are also many other uses for post-processing. You can for example use the software to combine images. You can create HDR images with an improved dynamic range from shots with different exposures, or you can create panoramic images by stitching images together. And you can use focus stacking to improve the depth of field.

Also, you can apply creative filters, layers, and textures, to put your own creative touch on the images. For example, you can make your insect shots black-and-white or give them a special look. I will discuss this further in week 17 on page 129.

Finally, you use post-processing to prepare your images for distribution. Depending on the use you might want to change the resolution, add a logo or watermark, add a border, and so on.

JPG or RAW images

Most cameras can produce both JPG images and RAW images. RAW images simply provide the pixel values that are recorded by the sensor. JPG images are processed and compressed inside the camera.

JPG images are, in principle, ready to be printed or published. They take all the settings of the camera into account, like the white balance. The camera applies lens correction to remove certain distortions the lens might produce, it removes noise in images shot with high ISO values, and it often sharpens the image somewhat. Also, creative filters that you set in the camera are applied. For example, smartphones do a lot of processing on the images. That is the reason images from smartphones sometimes look better than the same shots from an expensive camera.

RAW images are larger because they store more color information for each pixel. Often, they use 12 or more bits per pixel rather than the 8 in JPG. This means you have 4096 different intensities for each color, rather than 256. They are not processed or compressed in any way. RAW images initially look worse than the corresponding JPG images. You must do some post-processing when using RAW! But because of the extra color information, you have much more flexibility to improve these images compared to what can be done to improve JPGs. There is a lot more detail to work with in the RAW image.

If you do not want to spend time in post-processing, you are always free to use the JPG images! The photo apps that come with Windows or MacOS can perform basic functions such as cropping without a problem. But when you want to get the most out of your shots, use the RAW files and process them with a tool that can handle them.

I make my camera produce both JPG and RAW files. I use the JPG file when I quickly want to use a shot. And I use the RAW files to produce all final images.

My standard workflow

Let me describe the basic steps I take when processing an insect shot. I use ON1 Photo RAW[11] for this, but you can use most commercial photo processing tools, like the popular Adobe Lightroom and Photoshop[12]. The tools that come with your operating system are too limited to handle RAW files.

Cropping and rotating

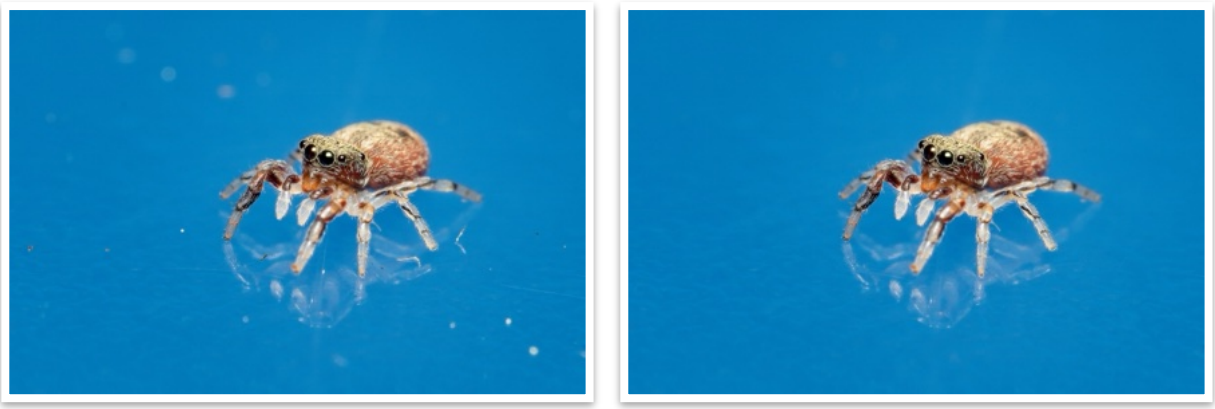
First, I crop and sometimes rotate the image. This has several goals. For small insects it increases the magnification. The main goal though is to improve the composition. Small changes can have a major impact on the final image. I also crop and rotate the image to get rid of some larger distractions in the background or foreground. In the example below of a ladybug, the horizontal stem was somewhat boring. So, I rotated the image. Using some further cropping I also got rid of the leaf in the top-left corner, creating some negative space.

[11] https://www.on1.com/
[12] https://www.adobe.com/products/photoshop-lightroom.html

By cropping and rotating the image slightly, I created more action in the scene and the top left of the image became more open. 70 mm, 1/320 sec., F/16, ISO 400, flash.

Retouching

There are often small distractions in insect shots. For example, there can be ugly spots on leaves, there are often spider webs or other traces of insect activity, and there can be areas in the background that are too prominent. Image processing tools nowadays have excellent functionality to remove such distractions while keeping the image looking natural. It is up to you how clean you want the image to be. Don't overdo it though. This is nature.



By retouching you can remove distractions in the background. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Developing

RAW images need to be developed because the data that is produced by the sensor gives a rather flat image. RAW image development consists of two parts: adapting the tone and adapting the colors. Many image processing tools have functionality to do this automatically. But for insects this often does not lead to the desired result, so I normally develop the images manually.

You can adapt the tonal information by changing the global exposure or by increasing or reducing the darker areas (blacks and shadows) or lighter areas (whites and highlights). Many insects are dark, so I normally crank up the shadows a bit. Because I use a flash, there can be some prominent white reflections, so I tend to tune the whites and highlights down a bit. Whether and how I change the mid tones depends a lot on the scene.

For colors you can adapt the white balance to make the image warmer or cooler. When using a flash, warming the image up a bit often improves it. You can also change the saturation of the colors and the vibrance. Increasing the vibrance gives the insect a bit more pop. However, it can make the

colors too saturated, so you might at the same time reduce the saturation to keep the colors natural. Focus on getting the insect right. Don't worry too much about the background at this stage. You can adapt that later using filters.

In this image I made the shadows lighter and reduced the highlights. As a result, the patterns on the wings of this Pinion-streaked Snout moth became nicer, while the background became less prominent. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

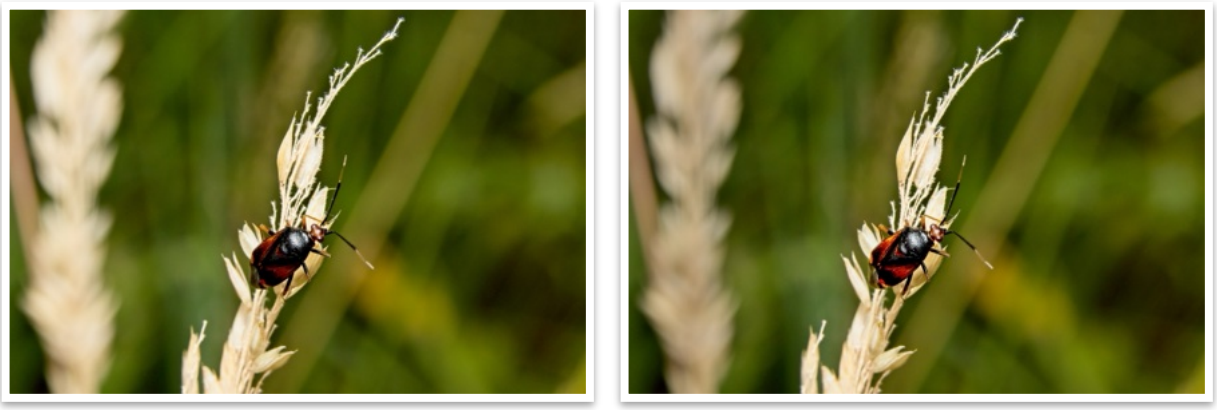
Noise reduction and sharpening

When a photo is shot with a high ISO value, noise is introduced. Modern tools do an excellent job removing such noise, based on AI models. Also, you might want to sharpen the image. I like insects to be as sharp as possible. Because sharpening can increase noise, it is useful to apply both, even at a low ISO value.

Noise reduction and sharpening are necessary for this wood ant. You can see the noise in the background in the image at the left, while you can see the effect of sharpening in the ant and the piece of wood in the image at the right. 400 mm, 1/500 sec., F/11, ISO 2500.

Local adjustments

Local adjustments apply tone and color changes locally to a part of the image only. For this, a mask must be created. There are many ways to create masks. You can paint them in, use gradients, base them on colors and intensities in the image, use AI to recognize subjects, and so on. Local adjustments can, for example, be used to increase the vibrance or exposure of only the insect. Or you can apply local adjustments to darken or desaturate parts of the background. For most operations, the mask does not need to be very precise, so it is easy to create it.



Two local adjustments were applied. The first lightens the insect, while the second darkens the distracting grass on the left of the image. 65 mm, 1/320 sec., F/13, ISO 200, flash.

Dynamic contrast

There are various ways to put more emphasis on the insect. One is to increase the dynamic contrast. Dynamic contrast adapts the contrast locally, based on the content. In Adobe Lightroom this property is called clarity. Apply dynamic contrast only to the insect, using a mask. The mask does not need to be precise. Best make the mask slightly larger than the insect, so that also the edges of the insect become sharper. Sometimes you can decrease the dynamic contrast of the background. This makes the background a bit flatter, putting more focus on the insect.

By adding dynamic contrast to the insect and a soft vignette to the whole image, more emphasis is put on the cockroach. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

You can also add a vignette. This makes the outside of the image a bit darker, leading the viewers' attention to the insect in the middle.

Color enhancement

With color enhancements you can adapt the saturation, brightness, and hue of certain color ranges. Many insects sit on green leaves and this green color can be rather dominant in the image. By reducing the saturation and decreasing the brightness of the green, you put more emphasis on the insect. Unless there is green on the insect, you do not even need a mask for this, so it is rather easy.

By desaturating and darkening the green colors slightly, the background behind this midge becomes less dominant. 80 mm, 1/320 sec., F/13, ISO 200, flash.

Shot of the week

These striped bugs have a much more interesting name in Dutch. They are called pajama bugs. I had seen pictures of them before, and I wanted to get a shot of them myself. When I found a couple on a plant in a nature garden, I was happy. But the problem was that these bugs have a very nice-looking top with stripes, but also a nice-looking bottom with all the dots. So, I tried to take a shot where you see both. This one was resting under a canopy of flowers. I like the composition, even though the eyes of the bug are not very visible. Since then, I have seen them at many more places.

Lens at 120 mm, 1/320 sec., F/13, ISO 200, flash.

Week 10: Getting a macro lens

After using my kit lens and extension tubes for two months, I decided it was time to get a true macro lens. In this chapter I discuss the requirements, the process I went through, and the lens I chose in the end.

Requirements

Before buying a macro lens (or any lens), it is good to make a list of requirements. Taking a few thousand insect shots was very useful in understanding what I wanted. If I had bought a macro lens at the very beginning, I would have made a different choice, which would not have been the right one for me. Note though that my requirements are not necessarily the same as yours.

Rhododendron Planthopper. The first shot I took with the Canon RF 100mm 2.8L Macro lens. 100 mm macro, 1/60 sec. (The low shutter speed was a mistake, but a good test for image stabilization), F/13, ISO 200, flash.

Manual or automatic? Traditionally, macro photographers used manual focus and a tripod. As a result, most macro lenses are completely manual. For example, Laowa produces a series of great manual macro lenses. If you plan to use manual focus, such a manual lens is probably best for you.

There are several situations in which an automatic lens is the better choice:

- When your camera and the lens have fast enough autofocus to use this effectively for insect photography.
- When you want to use the lens also for different shots. Macro lenses are often also used for portrait photography.
- When you want to use in-camera focus bracketing. To be able to create images with different focus depth, the lens must have autofocus.

Initially I planned to go for a manual lens. But once I realized autofocus did work well on my camera and I started to experiment with focus bracketing, I decided that I should get an autofocus lens instead.

If you use a manual lens, you need to know that the camera does not register that the lens is on the camera. Most cameras won't take pictures if there is no lens. So, you must tell the camera to also shoot without a lens. This can be set in the menu. Also, realize that no information about the lens is stored in the EXIF information of the image. In particular, the image will not contain information related to aperture or focus length.

Magnification. Officially, a macro lens should have at least 1x1 magnification. Be careful though. Many lenses have macro in their name, while only achieving a 0.5 magnification factor. So how much magnification do you need? This depends on the type of insects you want to photograph. If you are primarily interested in large insects, like butterflies, 0.5 magnification is enough. But if you want to shoot beetles and bugs that are often (much) smaller than 1 cm, you need a lens with a magnification of at least 1, and preferably more.

It is good to do a little bit of math here. Say, you want to shoot an insect that is 5 mm in size. You need some space around it, so the final image should, for example, cover 12 mm in width. If your camera takes high resolution photos, you can use digital cropping, so the camera can produce an image covering 24 mm in width. That means you need a magnification factor of 1.5 for a full-frame camera and 1 for an APS-C camera.

A Nettle Tap. This is a very tiny moth (6 mm) requiring lots of magnification. 100mm macro, 1/320 sec., F/13, ISO 200, flash.

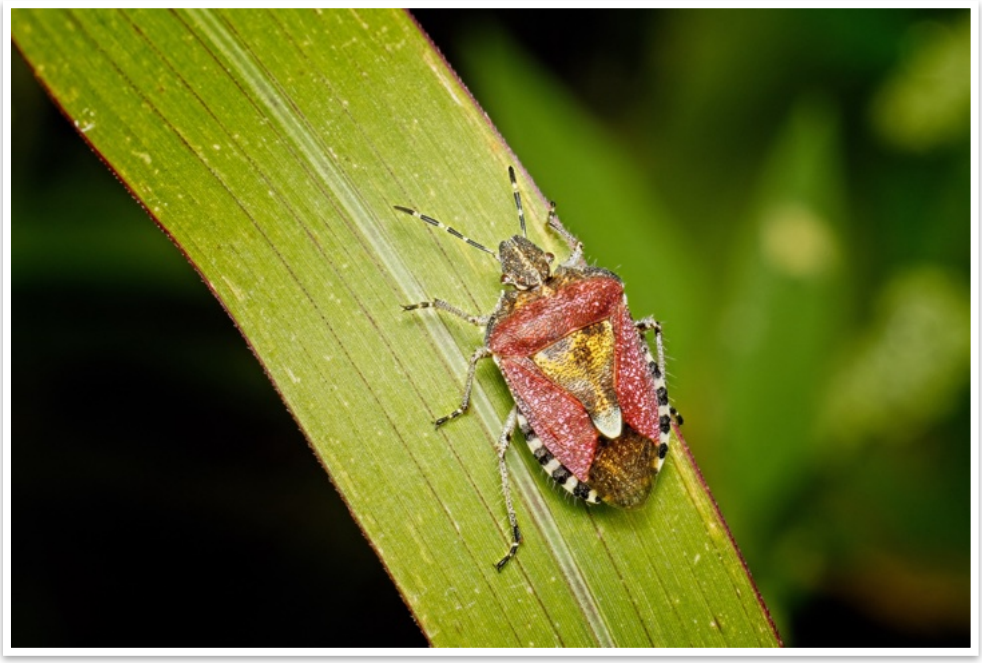
Focal length. The focal length of the lens determines the minimum focus distance at which the maximum magnification is achieved. A large focal length of 85 mm or 100 mm means that you can stay at a reasonable distance from the insect. Small focal lengths, like 24 mm or 35 mm, mean that you must get much closer. But lenses with a small focal length are normally smaller, lighter, and cheaper. Also, the smaller the focal length, the larger the depth of field. I recommend not to go below 65 mm for insect photography. For other types of macro subjects, like flowers, a smaller focal length is no problem. Flowers don't fly away.

Aperture. For many types of photography, the maximum aperture of your lens (that is, the smallest F value) is very important. But lenses with a wide maximum aperture are expensive. For insect photography this is normally not an issue. You need a large F value, like F/11 or F/13 to get enough depth of field. So, whether the lens can do F/2.8 or not is irrelevant, unless you want to use the lens for other purposes as well.

Focus speed. If you go for an automatic lens, you need a lens that, together with your camera, has a fast and accurate autofocus. Otherwise, you'd better get a manual lens. There can be a big difference in focus speed between lenses. Modern lenses tend to be considerably faster than older lenses.

Image stabilization. Because I use flash all the time, image stabilization is not required to avoid camera motion blur. But it does help to get a more stable image in the viewfinder and to focus more easily. Manual lenses do not have image stabilization. They cannot have any motors because they have no power supply from the camera.

Image quality. You obviously want a lens with excellent image quality. As I use an APS-C camera, the image is cropped and only the center part is visible. Hence, image quality in the corners is not important, as the corners do not show in the image. But the center part of the image is recorded at a high resolution, so excellent central image quality is essential.



Hairy Shield Bug. With a macro lens you need less crop and get improved image quality. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Making a choice

My main requirements were a fast autofocus lens, at least 1x magnification, and at least 65 mm focal length. This left very few options for my Canon R7. The camera has an RF mount for which currently only Canon makes autofocus lenses, and there was just one macro lens that met my requirements: the Canon RF 100 mm 2.8L macro lens. This is an expensive, professional lens with a 1.4 magnification factor. It is a bit large and heavy but, according to the reviews, has excellent image quality.

The alternative was to go for an older lens with an EF mount. These older lenses are considerably cheaper, and you can get used versions. You need an adapter to put them on a camera with an RF mount. I read a lot of reviews, most of which suggested that the new RF lens was better, especially with autofocus. But reviews tell you just part of the story. You must try them out. So, I rented the RF lens and the cheaper EF predecessor and did two days of testing. My conclusion was that both are excellent macro lenses but that the newer lens was indeed better. For more information about the comparison, see my article about the lenses[13]. Always test lenses before you buy them!

The Canon EF 100 mm on the left, with EF to RF converter, and the RF 100 mm at the right.

The advantages of a macro lens

So, what are the main advantages of using a macro lens over a normal lens with extension tubes or a close-up lens? They fall in three categories: convenience, magnification, and image quality.

Convenience is the biggest plus. Using a macro lens is much more convenient than using a kit lens with extension tubes. Here are some aspects:

- **It is easier to locate the insect.** With extension tubes the focus range (distance between smallest and largest focus distance) becomes small. When you are not in that range, the

[13] https://medium.com/full-frame/photographing-insects-choosing-a-macro-lens-159a93348719

image in the viewfinder becomes very blurry. This makes it hard to find the insect in the viewfinder. I lost many shots because I simply failed to locate the insect before it disappeared. With the macro lens you simply focus from a distance and then get closer to the insect with the focus button pressed. Piece of cake. The focus distance delimiter on the macro lens is useful here. Otherwise, the camera frequently spends time focus-seeking and might focus on the background rather than on the insect.

Cuckoo Wasp. It is much easier to take such shots with a macro lens. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

- **There is no limit on the focus distance.** For example, when I see a butterfly that is slightly further away, I can still take the shot when using the macro lens. Using a normal lens with extension tubes this is not possible. With the macro lens you can also photograph non-macro-objects, like a larger animal.
- **I can stay farther away from the insects.** With the macro lens you can stay farther away from the insects and still achieve a high magnification. This also avoids bumping into the plant containing the insect with the camera or the diffuser. That was a serious problem when using the kit lens with extension tubes. Once you hit the plant either the insect flies away, or the plant starts moving, making it almost impossible to focus.
- **No need to set a focal length.** When using the zoom lens with extension tubes, the magnification depends on the focal length. So, you must choose the focal length before taking the shot. This was an additional parameter to control, and I missed some shots by not setting it correctly. With the macro lens, this is not an issue, as it has a fixed focal length.
- **The macro lens is weather sealed.** As a result, no dust, rain, or condensation can get into the lens or the camera body. Not that I shoot in bad circumstances, but it makes you worry less when you shoot in wet, dusty, or humid environments.

None of these aspects influence the photographs themselves, but they make your life as a photographer easier and lead to more successful shots.

A Capsid Bug. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

The macro lens does give a larger maximum magnification factor. With my 18-150 mm zoom lens and 31 mm of extension tubes I could reach an effective magnification factor of 1.38 (for APS-C sensors). With the macro lens the maximum effective magnification factor becomes 2.24. That is a considerable difference and leads to more detailed images when you shoot small insects, like little flies and beetles.

The images quality is also better when using the macro lens. This is to be expected as this macro lens is from the professional L-series of Canon while the kit lens I used before is not. The parts of the image that are in focus are clearly sharper than with the kit lens. Because of the larger magnification I need less digital crop, which also improves the final image quality.

The flash and the lens diffuser work fine on the new macro lens. Because the macro lens is a bit thicker the diffuser fits better. I bump less into plants and the flash is still strong enough, even though the focus distance is increased.

I did not notice any improvement in autofocus quality and speed. The kit lens had great autofocus and the same applies to the macro lens. Image stabilization was already good on the kit lens, but it is slightly better with the macro lens, helping to keep the camera steadier.

The macro lens has a wider maximum aperture than the kit lens. I did not really use that yet, but it might be handy in situation where you cannot use a flash, like when doing handheld focus stacking or when you want to create continuous shots of a flying insect.

A small Delphacid Planthopper. 100mm macro, 1/320 sec., F/13, ISO 200, flash.

The focal length of 100 mm of the macro lens on a full-frame camera becomes 160 mm on my APS-C camera. That makes the lens rather useless when shooting in situations other than macro. The focal length is not enough for wildlife photography, and it is too much for photographing landscapes or people.

A Small Copper butterfly. You can easily switch between true macro and shots like these, without changing lenses. 100mm macro, 1/320 sec., F/13, ISO 200, flash.

When you are serious about insect photography, and can afford it, I recommend that you buy a good macro lens. But better first take a considerable number of shots with a normal lens. Only in that way you will understand what your requirements are and what macro lens will work best for you. Also, do a careful comparison before making a final decision. You are going to use this lens for many years to come.

Shot of the week

I read about a genetic modification that sometimes produces pink grasshoppers. So, I got excited when I saw this pinkish insect at the bottom of a thistle in an area where there were many grasshoppers. Only after I had taken several shots and managed to get a bit closer, I realized this was not a grasshopper at all. It was a Green Shieldbug. It turns out that the bottom of this very green insect can be orange/pink. So, it was not the pink grasshopper I had hoped to find, but it was still a nice shot.

100 mm macro lens, 1/320 sec., F/13, ISO 200, flash.

Week 11: Finding insects

To photograph insects, you need to find them first. Fortunately, there are insects everywhere, but that does not mean you see them. Here are some things I learned about finding interesting insects.

A Common Stiletto. 70 mm, 1/320 sec., F/13, ISO 200, flash.

I initially had some trouble finding nice insects to photograph. I was running around too much and was looking for things that moved. But that is not the best approach. Here are some tips that worked for me.

Location

Most of my insect shots I take close to home: in my garden, in an area near a little pond 1 km away, along a bike lane that is next to my house, and in a nature garden in a nearby town, some 6 km away. There is no need to travel far. In my garden alone I photographed more than 50 different species.

If you don't care what insects you photograph, almost any place will do. However, when you want to find specific insects, you need to go to the places where they are common. Many insects live near water. For example, dragonflies are best found at such places. Other species are found primarily in drier areas. Butterflies need flowers to eat nectar, but also specific plants to lay their eggs on. They can often be found in open areas bordering areas with trees and bushes.

It is useful to come back to the same location regularly. You start to realize that on certain plants there are many more insects than on other plants. It also helps when the plants are a bit high. It

makes looking for insects and photographing them a lot easier when you don't have to kneel all the time. Soon you will find a couple of favorite spots that you keep returning too. Try to concentrate on a particular type of species. When you are looking for everything, you see nothing.

Not all insects can be found close to home. This Beautiful Demoiselle is rare in the Netherlands. It is only found near clear streams. This shot was taken on a trip to Luxembourg. 150 mm, 1/320 sec., F/13, ISO 200, flash.

Season and time

In the Netherlands, there are few insects in the winter. The best time in the Netherlands is from April till September. This might be different in your country. In the morning, insects tend to move less than in the afternoon. This makes photographing them easier but finding them harder. In the evening there will be different insects which might be interesting, for example spiders, but they are harder to find. Best use a flashlight.

Chasing insects

Initially I was looking for flying insects. They are easy to spot. I followed them until they sat down and then tried to photograph them. That is a poor strategy (although sometimes unavoidable; like with butterflies). Moving insects are active and alert, so they quickly move away again. If a bee flies to a flower and you try to photograph it there, it most likely immediately moves to a different flower. On the other hand, if a bee is sitting still on a flower, it most likely stays there. So don't chase insects!

Look around very carefully to find insects that are not moving. This can be hard because they are small. Move very slowly and look for any tiny differences. A dark spot on a leaf, a thicker part on a stem, some color variation. Get closer and inspect the spot. Make sure your camera is ready and shoot. Never first check whether it is alive! I sometimes tend to do that, and when the answer is positive the insect is gone.

Beetles can often be found on stems. 70 mm, 1/320 sec., F/13, ISO 400, flash.

It is a good exercise not to move at all. Just stand in front of some bushes and slowly let your eyes move over them. Look from different directions. Initially you might not see much but almost always, after a while, you start seeing insects. When you shoot one, don't move on to another place. When there is one insect there are often more. Also look under the leaves. Some insects prefer that side of the plant. And don't forget to look at the stem. An interesting challenge is to find a spot next to some flowers and/or bushes, sit down, and stay there for half an hour. Just look around and photograph what gets near you. You will be surprised how many things you see if you take the time.

Six-spot Burnet together with a bug. 150 mm, 1/320 sec., F/13, ISO 200, flash.

Sometimes, when photographing one insect, you find another one in the same picture, like in the image above of a Six-spot Burnet. I only noticed the green bug when I looked at the image on my computer. However, it is rare that the second insect is sharp as well. Better be aware of this. I have found many nice little insects while I was photographing something else.

Butterflies and dragonflies

Butterflies and dragonflies require a somewhat different strategy. Many of them are difficult to find when they are not moving around. So, contrary to other flying insects, I do look for flying individuals. When I see an interesting butterfly or dragonfly I follow it around with my eyes, without moving, until it sits down somewhere. I set my camera in the right mode and make sure the flash is charged. Then I very slowly approach it. I first take a picture from a distance and then try to get closer. When the insect flies away, I repeat the process. When it continues flying away, I give up. It is simply too active. With a bit of patience, you can get very close to them. It feels like they get used to your presence and then ignore you.

A Blood-vein butterfly. I had to follow this one around for a long time before it finally stopped moving. 150 mm, 1/320 sec., F/13, ISO 200, flash.

The little ones

I like small insects of less than a centimeter. Because they are so hard to see with the naked eye, the effect when using a macro lens is more amazing. They can have wonderful details and colors, but they are much harder to photograph.

Finding small insects is obviously harder than finding large ones. It is also a different mindset. When you try to spot large insects, you simply won't see the small ones. Only when you deliberately try to spot small insects will you see them. It takes time for your brain to adapt to that. Often, in the beginning, I do not see them at all. But when I spend more time, they start appearing everywhere.

Small insects might look boring at first sight. But once you look through the viewfinder you are often surprised. It turns out that the little fly has beautiful colors or eyes. There are patterns, hairs, little antennae, and so on.

A Green Leafhopper that was about 8 mm long. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Many small insects are relatively easy to approach. With my new 100 mm macro lens I do not have to get too close, which helps. When they sit still and there is basically no wind, it is relatively easy to photograph them, if you manage to keep your camera still. And you can always rely on a bit of digital crop.

A tiny yellow fly of less than 3 mm in size, called a Thaumatomyia notata. 70 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

Up to now I always went photographing insects on my own. I guess that with two people you will see a lot more. On the other hand, the quietness of being alone in nature with your camera also has its charm.

Shot of the week

When searching for insects in my garden I noticed this tiny fly at the end of a leaf. I was amazed about how it was balancing on its rear legs. Only after I took the shot, I realized why it was doing this. It was using its other four legs to eat an even tinier fly. I would have never seen that without looking through my macro lens. If you take the time to look around, you can find amazing shots. By taking the shot from the side, it was possible to get keep the whole insect in focus.

100 mm macro lens, 1/320 sec., F/13, ISO 200, flash.

Week 12: Weather and hazards

The weather has a big influence on the insects you see, and on how you best photograph them. When it is raining or there is a lot of wind, shooting insects is impossible, but a sunny day has its challenges as well. Photographing insects is not without dangers. In this chapter I discuss some things I learned about dealing with the weather and protecting yourself from hazards.

A Bird-cherry Ermine Moth on the stem of a blackberry. Care is required to avoid being hurt by the thorns. 90 mm, 1/320 sec., F/16, ISO 200, flash.

Time of the day

Early in the morning is a good time to photograph insects. Insects are cold-blooded. They must warm up before they can be active. After a cold night, when the sun is shining in the morning, you can often find insects sitting in the sun. This is an ideal moment to photograph them, because they will not fly away and can be approached at close range. They might not be at the nicest spots though. They won't sit on flowers, as they do not drink nectar yet. When insects don't move, they are also harder to spot. You see less insects in the morning and you must look very carefully to find them.

In the afternoon, insects become a lot more active. They fly around (when they have wings), visit flowers, and try to find other insects to mate with. Because they are more active, it is harder to photograph them. Still, I prefer this time of day over the morning. There is simply more going on. At

the end of the afternoon, the insects slow down a bit. I often go out photographing in the second half of the afternoon.

Dusk can be interesting as well. Other insects appear, for example certain moths. Shooting them though is hard because there is little light. Focusing with little light is difficult. The autofocus of your camera will be slower and less accurate. You must use a flash at this time of the day.

A Silver Y moth drinking nectar at dusk. It took many shots to get one in focus. 150 mm, 1/320 sec., F/16, ISO 400, flash.

Weather

The weather plays an important role in spotting and photographing insects.

Sunny

Sunny weather is normally the best for photographing insects. The light changes considerably during the day. Early in the morning and late in the afternoon you have much warmer light because the sun is low. They call this the golden hours. When you are using a flash, this does not matter, but when you want to use natural light, the light is best at these moments.

The main challenge when photographing insects on a sunny day is shadows. The sun casts harsh shadows. Shadows that partially cover the insect usually make poor photos, and the shadow of the insect itself can also be rather ugly. Landscape photographers like to shoot during the golden hours. The light is nicer then, but the shadows are much larger. For insect photography that can be problematic.

I photograph with a flash most of the time. Because I use a fast shutter speed (1/320 sec.), high aperture (F/13) and low ISO (200) the ambient light has hardly any influence on the image. In this case it does not really matter whether the insect is partially in the sun, and you do not see its harsh shadows anymore.

If you prefer natural light, you must be aware of the shadows caused by the sun. You best photograph an insect in the shade. Also, shadows are less prominent if there is a lot of depth

variation in the background. For example, when the insect is on a flower with many little petals, the shadow is divided over all these petals and, hence, not dominant anymore.

This Knotgrass Leaf Beetle was shot without a flash in the sun. As a result, there is a shadow stripe over its body, reducing the quality of the shot. 335 mm, 1/640 sec., F/8, ISO 320.

Also, on a sunny day, be careful with your own shadow or the shadow of the camera. While you move closer to the insect, your shadow often passes onto the insect. That scares the insect away. Make sure you approach it from a direction where this does not happen. I have lost many interesting shots this way.

Cloudy

Cloudy weather makes shooting insects easier. There are no shadows to worry about. But when you are not using a flash, you must deal with considerably less light. You might have to use a slower shutter speed (1/125 sec.), lower aperture (F/8), and/or higher ISO (400-1600). On cloudy days I always use a flash.

Insects are less active on a cloudy day. That makes them harder to spot, but easier to photograph. This also depends on the temperature. When it is warm, the insects are active, but when it is cold you will have a much harder time finding interesting shots.

In the Netherlands, we have many days where sun and clouds rapidly alternate. On such a day it is key to be patient. Wait for the right light before taking the shot. Use automatic ISO such that your exposure is always correct.

Rain

When it is raining, there is not much sense to try to photograph insects. They are hiding. So, it will be a frustrating undertaking. But when the rain stops and the sun appears, you can take interesting shots. The insects will come out and will sit in the sun to warm up and dry off. There will be raindrops on the leaves and flowers, and sometimes also on the insects themselves. This can give a nice effect to your image. (You can use a plant sprayer if you want to simulate this on a dry day.)

When plants are wet, in the Netherlands you see many little snails. They can also make nice subject to photograph.

However, care must be taken. Everything is still wet. Because you are photographing from a short range, water easily gets on your camera and lens. Also, you will get wet yourself by touching bushes or kneeling in the wet grass and mud. Bring a piece of plastic to sit on, or wear rain pants.

A Harlequin Ladybird with raindrops on his body. 80 mm, 1/320 sec., F/13, ISO 200, flash.

Wind

Wind is the biggest enemy of insect photographers. When the leaf or branch an insect is sitting on is moving, it becomes almost impossible to focus. When using manual focus, you must predict the motion of the leaf and press the shutter at (or just before) the moment the insect will be in focus. Autofocus only works when your camera and lens are very fast, and the magnification is not too large. In both cases, most of your shots will be out of focus, so you need to take plenty. Some people suggest holding the branch or leaf with your left hand, but my experience is that this does not work well and often scares the insect away.

The best recommendation is to get to a location where there is less wind. Often there will be places in the lee, like behind some trees or a wall. Also, get to the lee side of bushes. And sometimes you can use your body as a shield. It also helps to stay low to the ground or photograph insects that sit on stable surfaces, like the ground or a tree trunk.

Hazards

Being out there in nature is great. But there are also some hazards you must be aware of. Photographing insects is not without danger, although most risks are moderate. First, there are dangerous insects. In the Netherlands we do not have threatening insects, like poisonous spiders, but we do have many insects that can sting or bite and when you are allergic to these stings, the insects can form a serious threat. Know what insects in your country are dangerous and keep your distance to them.

Up to now I have never been stung by a bee or wasp, even though I like to photograph them from close range. Initially, large hornets are frightening, but they haven't hurt me so far. I did get my fair share of mosquito bites though. When it is humid, mosquitos can be a serious annoyance. I often photograph insects near water, so there are always mosquitoes around.

A European Paper Wasp, sitting in the sun. Such a wasp can often be approached at close range. 130 mm, 1/320 sec., F/13, ISO 200, flash.

Probably the biggest risk in the Netherlands are ticks. They can carry Lyme disease, which is nasty. When you are walking through high grass or bushes, they easily get on you. In the first couple of weeks of photographing insects I was less careful, and I got them on me twice. If you remove them immediately, they cannot do much harm. Since then, I have been more alert when I was walking or sitting down, and I used insect repellent that worked against ticks. Also, each time I have been out there, I inspect my body for ticks. Better to be safe than sorry.

What is more of a problem are plants with thorns, or nettles. When trying to photograph an insect from an interesting angle you often touch those unintentionally. The best remedy against this is to wear closed shoes and socks, long pants, and a shirt with long sleeves. But in summer that might be uncomfortable. I also always wear knee pads to protect my knees when kneeling for those low shots.

You must be careful that you do not trip over or bump into objects. When you are looking for insects, you tend to forget to look where you are walking. This gets worse when you look through the viewfinder of your camera. One of my favorite spots for insect photography is along a bike lane. I have had some close encounters with bikers. In some places you might run into wild animals. Always be on the lookout for danger.

A final hazard is the sun. When you are out there in the sun for a couple of hours, you easily get sunburned. You are too focused on your photography to notice what is happening. Always use sunscreen lotion. Also, wear a baseball cap. It protects your head from the sun, from mosquitos, and from hitting branches. Turn it backwards. Otherwise, it will bump into the flash.

Besides protecting yourself, you should also protect your gear. Initially I was wearing a shoulder bag with my gear. But when you are bending yourself in all kinds of ways to get the best shot, the bag easily bumps into things. The same can happen with a backpack. I prefer to take nothing with me, except the camera that I am using. That works considerably better. You are way more flexible. When you need a bag, put it on the ground when you are taking shots.

Shot of the week

On a rather damp morning after a lot of rain, there were not too many insects around. There were lots of snails though, but snails are not really my thing. So, I was happy when I saw this fly sitting on top of one of the tiny snails. However, it was walking all over it. It took a long time before the fly took this nice posture, looking forward. The shot was considerably harder to take than it might look. The snail was sitting between lots of wet stems and leaves, so it was hard not to touch anything and scare the fly away. But I am happy with the result. The lighter leaf in the background behind the fly offers the desired contrast for the fly. Sometimes a little humor in pictures adds a nice touch.

100 mm macro lens, 1/320 sec., F/13, ISO 200, flash.

Week 13: Tripods and monopods

Keeping the camera still at the desired focus distance, is the hardest part of photographing insects. The larger the magnification, the more difficult it becomes. Up to now I photographed all insects handheld. But extra stability would be useful. So, I decided to investigate whether tripods or monopods would be useful.

Many macro photographers recommend that you use a tripod. This makes it possible to focus very precisely on the desired position, and you can also use a longer shutter speed and, hence, a narrower aperture or lower ISO value. An alternative to a tripod is to use a monopod. It provides less stability but is more flexible. But does it work when photographing insects?

My camera on a tripod with a focus rail.

Tripods

A good tripod effectively immobilizes the camera. It is normally used to fix the composition when taking a shot, and to reduce the required shutter speed. For macro photography, there is an additional advantage in that you can very precisely focus on a desired position.

Advantages

Using a tripod has several advantages.

Fixing the composition. For insect photography this is not easy. A small change in the location or orientation of the tripod has a huge effect on the area that will appear in the photo. Most tripods have a ball head. This gives you the flexibility you need to take the shot from the desired position. But a problem is that, after you fix the ball head, it tends to still move a little bit down. This happens often with a heavy lens, so you must correct for that.

It helps to use a focus rail. You place this rail on top of the tripod and then place the camera on top of the rail. The rail lets you slide the camera forwards and backwards. You can position the tripod slightly further away from the subject, point it in the correct direction, and then slide the camera forwards until the composition is correct.

Reducing the shutter speed. When the camera is on a tripod, there is no risk of camera motion blur. So, you can use a longer shutter speed. This of course assumes that the insect is not moving, neither by itself nor due to wind. When there is less light, and you don't want to use a flash, this is important because it allows you to still use a narrow aperture to get enough depth of field, and a reasonable ISO value.

However, pressing the shutter button can cause camera shake, and even the mechanical shutter causes some vibrations. You best use a remote control or set a delay of 2 or 5 seconds when taking the shot. Use the electronic shutter or first curtain electronic shutter (see page 20), to avoid motion blur caused by the shutter. Also, switch image stabilization of the lens and camera off. They are not necessary when using a tripod and can introduce motion blur themselves.

Better focusing. There are different ways to focus with the camera on a tripod. When you use autofocus, set the correct focus point, and then simply use autofocus. When using manual focus, you must use the focus control on the lens to get the correct position in focus. Use the manual focus support features of your camera, like focus peaking or magnification (see page 36).

You can also focus manually using a focus rail. You can move the camera forwards or backwards until the subject is in focus. There are three different types of focus rails. For the cheapest ones you slide the camera yourself backwards and forwards. This is not very good for focusing. Others have a knob you can turn. This allows for very precise focus. There are also motorized focus rails. These can move the rail in very small increments. This gives the best focus, but they are also the most expensive and cannot be used outside. Motorized rails are often used for focus stacking.

Disadvantages

There are some serious disadvantages in using a tripod for insect photography.

You must carry around extra equipment. Tripods become heavy after a while. When you use a backpack to hold the tripod, this limits your movements among bushes and trees.

It takes time to set it up. It easily takes a few minutes to put the camera on the tripod and place it at the correct position, and you must reposition it if the composition changes. There is a big chance the insect will be gone by then. And having to go through all that trouble means that you are taking less shots.

It only works when the insect is not moving at all, and neither is there any wind moving the insect. This is rarely the case.

Insect photographers that use a tripod often go out very early in the morning. The insects are not moving at that time as they first need to warm up. Also, there is often less wind early in the morning. And you can use the beautiful early morning light.

For me, using a tripod to shoot insects in the field does not work. The disadvantages outweigh the advantages. There are a few situations though where a tripod can be useful.

Photographing dead insects. You can find dead insects everywhere, or you catch them yourself. You can then photograph them inside, under controlled lighting. Here a tripod is very useful. You have all the time to set it up and you can create the perfect composition. When using focus stacking to increase the depth of field, this is essential.

When you know an insect will appear at a particular spot. For example, sometimes you know that insects appear from a nest. Or there is a flower that often attracts insects. You can set up the camera on a tripod, wait for the insect to appear, and use a remote control to take the shot. Focus can be an issue though in such cases. For certain cameras you can use an app on your mobile phone as a remote control. These apps often allow you to focus as well. Otherwise, you must set a reasonable focus distance and use a large depth of field to make sure the insect is in focus.

When you know that an insect, like this parasitic wasp, will appear from some hole or nest, you can use a tripod and remote control to wait for it. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Monopods

Monopods are easier to carry around and provide more flexibility. But they also provide less support and cannot fix their own position. You must always hold them with your hands. There are many monopods available at very different prices. As you will always hold the camera while shooting, it does not need to carry a lot of weight and you do not need a fancy head. But it must be light, long enough, and quick to set up. After some comparisons, I bought the Leofoto MP-284C. It consists of just 4 segments which makes it fast to extend. I also bought a cheap Utebit ball head. I didn't need anything fancier. Make sure that you can extend the monopod with one hand. You need the other one to hold the camera.

The Leofoto MP-284C monopod with Utebit ball head.

Using a monopod requires some practice. You can find general descriptions of how to use a monopod on the web[14]. But using a monopod for insect photography requires some different techniques I discovered, which I describe here.

Six degrees of freedom

You can move a camera in six different ways. You can move it up-down, left-right, forwards-backwards and rotate it around three axes (left-right, up-down, and around the line towards the subject). When using a tripod, you normally fix all of these.

With a monopod this is different. When you fix the ball-head, you still have two degrees of freedom left, by pivoting the monopod around the point where it contacts the ground. This moves the camera forwards and backwards and left and right. You must fix these with your body.

But for insect photography you do not want to fix the ball-head. You want the flexibility to position your camera at the correct place with respect to the insect, and you also need to move the camera back and forth while keeping it pointing to the insect. So how do you achieve this? Here is my approach.

Keep the ball head somewhat loose. You need the freedom to rotate the camera while pivoting it around the bottom of the monopod, to keep it pointing towards the insect. But it should not move too easily.

Hold the camera with two hands. The usual advice is to put your left hand on the monopod. But, because you loosen the ball head, this does not work. Better hold the camera with two hands as if you are shooting handheld.

Press the camera against your face and press your arms against your body. Do this in the same way as if you are shooting handheld. The monopod is just going to give you extra support.

Push in the direction of the monopod. This will create the support you need. Don't push too hard though.

[14] https://www.wikihow.com/Use-a-Monopod

A Capsid bug of 8 mm (without the antennae). Using the monopod, it is easier to take shots at higher magnification (1.3 in this case). 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Positioning the monopod

Putting the monopod vertically is not the correct way to use it. You will only limit vertical motion, which is not good enough. You best put it at an angle. My preferred method is to put the bottom of the monopod backward and a bit to the right, so slightly to the right of, and behind my right foot. In this way I can use my left hand to push the camera against the monopod for stability. (For extra stability you can push your right leg against the monopod.) The advantage of this position is that you can still move the camera towards and away from the subject. This works best when using autofocus but also with manual focus it can be used.

Alternatively, you can put the monopod at an angle forward. That gives a bit more stability as you can lean into it. But you lose the ability to move towards and away from the insect. With autofocus this can still work, but not with manual focus, unless you use the focus ring. Also, the monopod might hit the plant that contains the insect, scaring it away or causing motion.

In the field

Using the monopod did reduce the motion of the camera, so it indeed makes it easier to focus. My keep rate of sharp images did go up. When using a high magnification, like for the Capsid bug above, it helped to keep the camera steady and get a sharp shot.

Although better than a tripod, a monopod also limits you considerably. It is basically impossible to photograph the insect at strange angles (like upside down) or between plants and branches. Also, getting the height right requires some practice. For small height changes it is easiest to change the position of the bottom of the monopod, rather than change the sections. The insect still must be a bit patient. Photographing insects that can fly is hard, but a caterpillar like the one below works well.

Caterpillar of a Knot Grass butterfly. Shot with a magnification of 1.5. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Other support

Tripods and monopods make it difficult to take shots close to the ground. Some tripods allow you to reverse the central shaft and have the camera hanging below the tripod. But that is complicated and takes a lot of time to set up. There are some alternatives though.

The easiest solution is to simply put the camera on the ground or on some rock or piece of wood. If necessary, you can put your left fist between the camera and the ground or put it on your elbow. Or you can put the camera on your knee or upper leg when you kneel. Any support will help to reduce camera motion.

You can also buy bean bags. You fill a bean bag with beans or rice, put it on the ground, and put the camera on top of it. You can model the bag in the shape you want to let the camera point in the correct direction. It is rather effective in supporting the camera or the lens. You can also put it on other objects, like thick branches. But a bean bag is heavy to carry around when filled. And the usefulness in insect photography is limited.

Shot of the week

On a beautiful, sunny morning I went out with a group of nature photographers to shoot insects. We went to a nice flower garden next to a castle. The flowers looked amazing. But unfortunately, there were primarily bees on them. With some effort, I managed to shoot some flies as well, but nothing interesting. So, I decided to walk to a piece of grass and some bushes outside the flower garden. And here suddenly insects were in abundance, including the tiny grass bug in the image. As it is a grass bug it was sitting in the low grass. By kneeling and supporting the camera on the ground I could take this shot from a low position. If you don't see insects at one place, just move a bit further and look for other opportunities. Insects are everywhere.

100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Week 14: Smaller and smaller

Many insects are very small, just a few millimeters in size. Finding and photographing them is a challenge, but very rewarding. They often look amazing, and you can show your viewers something they have never seen before. I noticed that during my journey I was attracted more and more to the smaller creatures. Here are some techniques I discovered.

A plant bug (Heterotoma planicornis) of 5 mm. When you look through the viewfinder you see the amazing antennae, the nice back pattern, and the contrasting green legs. 70 mm + 31 mm tubes, 1/320 sec., F/13, ISO 400, flash.

For smaller insects you need a larger magnification. An APS-C camera helps a lot because you get an extra “free” magnification factor of 1.6. Also, when your camera has a high resolution, you can apply a considerable amount of digital crop. A normal lens, with extension tubes can be used but a macro lens is recommended. And even then, the 1.4 maximum magnification of my lens is sometimes barely enough.

Focus

Focusing on small insects is not easy. You use a large magnification and, hence, the depth of field becomes shallow. You need to focus exactly on the correct spot. I prefer to use autofocus with the smallest possible focus area (spot) such that I am sure I focus on the desired position.

Insect eyes are small, so it is very difficult to keep the camera still with the small focus area on the eyes. Also, the autofocus system needs a tiny bit of time to focus, so you need to hold the camera directed to that location and at the same distance for a little while. The faster the autofocus of the

lens, the easier this becomes. You might still need a couple of shots to get one that is sharp. Check and magnify the results in the viewfinder, to make sure at least one of them is good.

I also tried manual focus, but photographing handheld with these large magnifications, the keep rate becomes very small. As described in the previous chapter, a tripod or monopod might help, but I prefer not to use them.

It is pointless to try to photograph such small insects when there is wind. It is impossible to focus with such high magnification on a moving leaf. A moving insect is also a problem. When the movements are small, you can try to guess where it is moving, focus there, and be patient. It will stop moving eventually.

Even when you focus perfectly, use a flash, and apply a reasonably narrow aperture (like F/13), the insect will not fully be in focus most of the time. The depth of field is simply too shallow. As described in week 8 on page 64 where we discussed positioning the camera, you can improve this by trying to put the whole insect in a single depth plane, either using a top-down shot, or a side shot. But those are not the most interesting shots. Sometimes you simply must accept that not the whole insect is in focus.

Small bugs can make great shots. This weevil (Mecinus pyraster) is only 4 mm long. 60 mm + 31 mm tubes, 1/320 sec., F/13, ISO 400, flash.

The pizza box method

Photographing tiny insects in their natural environment is difficult. But there is a different approach.

I went to an interesting lecture by the Dutch biologist and photographer Luc Hoogenstein. He has written a book in Dutch called *Mijn 1000 soorten tuin*, which translates to *My 1000 species garden*. In the book he describes how he tackled a challenge to find, in one year's time, 1,000 different species in his garden. It turned out this was easier than he thought, even though his garden is in the city and rather small.

One of the approaches he described was the *pizza box method*. You take a pizza box, or any other flat object with a border, place it under some bushes, and shake the bushes. Insects will fall in the pizza box, and you can then find out what they are or try to photograph them.

A very small encyrtid wasp (just 3 mm long), called a Bothriothorax, of which there are just a few sightings in the Netherlands. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

I had to try this for myself. Rather than using a pizza box I used a tray. The surface of the tray was, I think, slightly better for taking pictures. I have some ivy barriers between my garden and the neighbors, and I know there are lots of insects there. So, I put the tray under them and gave the ivy some shakes. The results were amazing. In a short period of time, I photographed at least 10 insects I had never seen before in my garden. One of them was the small encyrtid wasp in the image above. There were just a few sightings of it in the Netherlands. Nice to find it in my garden.

Using the pizza box method, I caught lots of small beetles, plant hoppers and little spiders. There were some flying insects, but you must be quick otherwise they are gone. It seems the insects are a bit surprised about what has happened to them. So initially they tend to sit still. But after a little while they start running around or fly away.

To make it convenient to take pictures of the insects, I put a table and chair close to the ivy. After I caught some insects in the tray, I placed it on the table and sat down. This gave me a nice and stable position to take the shots. I used the table as support. That made it possible to use much larger magnification without any focusing problems.

Because the insects are on the tray, you can easily rotate the tray to put them in the correct orientation for the pictures. Although, for some reason they always seem to turn their back towards me. Of course, the surface of the tray does not provide a natural background. You can add some leaves or stems in there. Insects tend to climb to the highest point, resulting in some nice pictures.

A Dustywing. When you put some stems in the tray with which you catch the insects, the insects crawl to the top of them, allowing for nice side shots, getting them completely in focus. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Adding a close-up lens

Sometimes, the 1.4 magnification factor of my macro lens was not enough, not even with my APS-C camera and a digital crop. A 1.4 magnification macro lens on an APS-C sensor using a digital crop to 8 MP results in an effective magnification of 1.4 x 1.6 x 2.0 which is about 4.5. This means that the width of the image covers just 8 mm. But when the insect is 2 mm in size, the insect still only covers a quarter of the width of the image. I needed even more magnification.

So, I started experimenting with adding my Raynox DCR-250 close-up lens on my macro lens. You can simply click it on the front when you need it. This brings the magnification factor of the lens up to a maximum of 2.25, which becomes 3.6 on APS-C, and 7 after a digital crop, reducing the width covered by the image to only 5 mm. That is great for insects that are just 2 mm in size.

Warning: Make sure the focus range of your lens is set to the maximum range! Many macro lenses have a focus delimiter, which limits the range in which the lens can focus. When I shoot macro, I normally set this to the near range (26–50 cm for my Canon RF 100 mm Macro). But the Raynox needs the whole range up to infinity to work correctly!

Using the macro lens together with the Raynox DCR-250, at close to maximum magnification, creates a very small depth of field. Also, with the Raynox the distance between the nearest focus point and the furthest focus point is just 7 cm. So, focusing becomes a serious issue.

I proceed as follows. I put the bottom of the front of the lens on the tray and half-press the shutter button. Depending on the angle the camera makes with the tray, the focus distance is smaller or larger. This influences the magnification. Now I slowly slide the camera towards the insect until it gets in focus. I make sure the focus point is where I want it to be and take the shot.

Another very small encyrtid wasp of just 2 mm. 100 mm macro + Raynox DCR-250, 1/320 sec., F/13, ISO 200, flash. Cropped to 8 MP.

Obviously, this approach only works when you want to take a shot from the side or the front, and when the insect is sitting on the tray (and not moving). When you want to take a top-down shot, or the insect is sitting on a little stem or leaf, like in the image above, I hold the front of the lens between the thumb and index finger of my left hand and place the other side of my hand on the tray. I can now easily change the distance between the camera and the insect while keeping the camera still.

Adding extension tubes

The second way to increase the magnification, is to use extension tubes. In week 7 on page 47 I described how extension tubes could be used to turn a normal lens into a macro lens. But you can also add extension tubes to a macro lens to increase the magnification. I have 31 mm of Meike MK-RF-AF1 extension tubes. If I add these instead of the Raynox DCR-250 I get the same maximum magnification.

Extension tubes have two disadvantages. First, using them is more work. You must remove the lens, add the extension tubes to the camera body, and add the lens again. The close-up lens just clicks on the front of the lens. Second, when using extension tubes you lose about one stop of light. With a flash, that is not a problem, but when you are using ambient light, you must increase the ISO value.

Extension tubes also have a big advantage over close-up lenses. When using the Raynox DCR-250, the range in working distance is only 5-12 cm, and it always gives a high magnification. For any insect larger than 15 mm in size, you must remove the lens. So, you are constantly adding and remove the close-up lens, depending on the required magnification. With the extension tubes, the range becomes 7-40 cm, which is way better. Also, the effective magnification at the largest distance is only 0.3, which means that it shows an area of 75 mm, and that is enough for almost all insects. So, you can leave the extension tubes on most of the time.

Also focusing is easier when using extension tubes and the depth of field seems larger, as can be seen from the close-up of a Hawthorn Shield Bug below. No digital crop was used for this picture. So, if you want to shoot a lot of small insects, I recommend using the extension tubes for extra magnification. If you need the extra magnification just incidentally, a close-up lens is easier to handle.

Close-up of a Hawthorn Shield Bug. 100 mm macro + 31 mm tubes, 1/320 sec., F/13, ISO 320, flash. No digital crop.

Shot of the week

Except for some butterflies, there are only a few species of insects that are blue or purple. So, I was really surprised when I caught this bright purple insect using the pizza box method described in this chapter. This is not an insect but a Common Rough Woodlouse. It has way too many legs to be an insect. It is also not special at all, but rather common. Normally they are gray and somewhat boring, but sometimes they get infected with the Irodo virus. That gives them a bright purple color. It is great for photographers, but not for the animal, as this virus is lethal.

100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Week 15: Photographing moths

This week I decided to do something rather different: photographing moths. It takes a little bit of preparation, but then you can admire this wonderful world that is hidden to most people. Worldwide, there are over 165,000 different species of moths. They have amazing colors and patterns, and they are easy to photograph.

A Grey Pine Carpet. The pattern on the wings is beautiful. A top-down shot helps to show this. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Nature organizations in the Netherlands regularly organize moth counting nights. I visited one of these nights and found it interesting. They provide a great opportunity to photograph these insects. In the Netherlands alone, there are over 2,000 species of moths (called night butterflies in Dutch) while there are just 53 species of butterflies. You can see some moths during the day (these are called day-active moths) but most you can only spot after dark. This requires some special preparation, which you can easily do at home.

Luring moths

There are several ways to lure moths after dark.

A lamp and a white sheet

The easiest way is to use a white bedsheet and hang it vertically. Put a strong lamp in front of it. The lamp attracts the moths, which then land on the sheet, and normally stay there for a long time. However, look around, they might also land on objects nearby. There is still a lot of debate about why moths are attracted to light. Search for it in Google and you find many different answers. The most common theory is that the moths mistake the lamp for the sky and direct the upperpart of their body towards the light. As a result, they start moving towards the light and get disoriented.

A Beautiful Hook-tip. This moth landed on a little branch, away from the sheet. So best look around using a flashlight. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

I recommend using UV light to attract moths. UV light is blue and does not look very strong, because most of it is invisible to the human eye. But be careful. Don't look at the light for too long as it might hurt your eyes. Moths can see it and are strongly attracted to it. If you want to start cheap, you can buy a used facial tanner that produces UV light. I got mine for 7 Euros. They are not waterproof, so you might add an umbrella above it when there is some drizzle. Very cheap and effective. In the image below you see my setup.

If you want to go one step further, get a 100-watt UV LED panel. You can buy these for 25 Euros on Amazon. They are waterproof, so a little drizzle won't hurt them (although I would put the connector and switch in a plastic bag, just in case). These are a bit stronger than the facial tanners, and easier to handle.

You do not need to stay outside and keep an eye on the sheet. Most of the time, the moths stay there for a long time. I normally just check every hour. Don't be surprised when your light also attracts various other insects, like beetles, and many midges. Sometimes hornets will appear, as they also hunt at night. When you are careful, they will not harm you and you can photograph them from close range. When you want to end the session, carefully remove the moths from the sheet and place them at a safe spot.

My setup to attract moths in the evening, with a cheap, used facial tanner, white bed sheet, and an umbrella for protection.

Sugaring

Not all moths are attracted by light. You can attract some of these other moths using a combination of fermented fruit and sugar. Alcohol also helps. There are many recipes for this on the web. Here is one:

> **Sugaring recipe**
>
> Take one or two overripe bananas, add a glass of (dark) beer or wine, optionally some rum for extra alcohol, and a box of dark sugar. Mix/blend it all well. Put it in a container with a tight lid and leave it in the sun for a few hours, such that it starts fermenting. Make sure it has the consistency of paint, otherwise add some more liquid or sugar.

Now paint the syrup on some trees, an hour before sunset. Check every half hour whether moths came to visit and drink the syrup. The moths don't stay all night. Once they have eaten enough, they leave again. So, you must check regularly to make sure you see all of them.

A Red Line Quaker, that is eating syrup from the tree through its long tongue. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Light traps

There are also special butterfly traps, also called light traps. They consist of a large bucket with a funnel on top of it, some egg cartons in it, a light above it, and some optional transparent polycarbonate sheets around the light. Nowadays, often UV LED lights are used for this. Best use a strip of the modern SMD 2835 UV LEDs. They can operate on a USB power bank, so you can use the light trap everywhere. You can build them yourself, or you can buy them from specialized shops. You can find instructions on the web[15]. I bought mine from the Dutch Butterfly Conservation[16].

The moths are attracted by the light, fly into the transparent sheets, fall in the bucket through the funnel, and hide between the egg cartons. You can leave the light trap out all night and then inspect it early in the morning. This is great for counting but does not work too well for photographing the moths, because they hide in the egg cartons. You can try to get them out of the carton onto a nicer surface. They normally are deep asleep, so they won't fly away. Turn the carton upside down and carefully tap on the back. The moth will fall out. Never touch the wings of the moth with your fingers. These are the most delicate parts of the insect. You can also slide a small piece of paper or a leaf under the front legs of the moth. It will then often crawl onto the paper, and you can move the paper in the best position to take your shot. Always treat the moths with care and respect and, after photographing them, put them in some bushes.

[15] https://butterfly-conservation.org/in-your-area/east-scotland-branch/bucket-for-budget-bucket-moth-trap
[16] https://www.vlinderstichting.nl/


My light trap at the left. And a December Moth between the egg cartons at the right. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Weather conditions

You attract the most moths when it is warm and a bit humid. A little drizzle is no problem if you protect the lamp. There are moths all year around, but when the temperature gets below 8 degrees Celsius, there is little chance you will see any moths. Summer is obviously the best time. You don't have to go anywhere for catching moths. In almost every garden you can attract lots of different moth species. You can even put the light trap on your balcony.

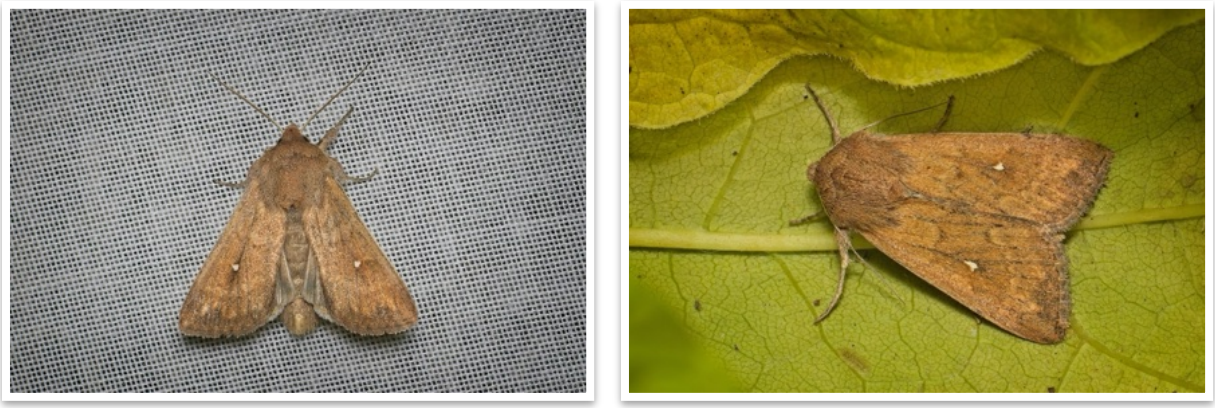
A Box-tree Moth. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Photographing night moths

Once a moth has landed on the sheet or next to it, it normally stays there for quite a while. You have ample time to take a good shot and you can get very close. You obviously need a flash with a diffuser. See week 4 on page 26 for more information on using a flash.

When the moth is on the white sheet, exposure is difficult. With automatic exposure (TTL with flash) the insect normally becomes too dark. Best use a positive flash exposure compensation to remedy this. Don't overdo it though. Otherwise, the white sheet becomes too white. It normally requires some post-processing to balance the intensity of the moth and the sheet.

When the moths are sitting on the sheet, they do not make for nice photographs. As they are almost asleep, you can move them somewhere else. Carefully place them in your hand (don't pinch them!) by tapping on the other side of the sheet. You can also shift a piece of paper below their front legs. Put them in the grass or on a plant and photograph them there. Afterwards, put them at a safe location.



A White-point moth, on the sheet and on a leaf. Even though identification is easier with the left image, the right image looks more natural. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

When the moth is on a tree trunk, it is often difficult to distinguish it from the background. You can solve this partially in post-processing. But it also helps to take the picture at a different angle, like from the side or from the front. Moths that are attracted to the syrup are active and not asleep, so you cannot manipulate them. They will fly away.

Focusing might be hard for the camera if the moth is sitting in a dark spot. Bring a good flashlight. You will need one anyway to find the moths that are not sitting on the sheet. To take the shot, I hold my camera, with flash and diffuser, with my right hand. With my left hand, I hold the flashlight and I support the bottom of the lens. That gives a stable hold. I point the flashlight at the moth and use that light to focus the camera. Then I take the shot with the flash. (The flash also has a focus light, but the diffuser will block that from reaching the moth, so it won't work very well.)

A Spruce Carpet moth. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Post-processing

The moth images almost always need some post-processing. The background is normally far from ideal. Also, the light attracts many other insects, which can form a distraction in the image. So, you need some retouching.

An Angle Shades moth with a beautiful back pattern. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

My post-processing process for these images is as follows:

- Cropping. Because of the symmetry of the moth, centering it often looks nice.

- Sharpening. To show the pattern on the wings as best as possible.
- Tone adjustments. This requires some care. Dealing with a white background is difficult. You best make the shadow tones lighter (the moth) while darkening the highlights and whites (the background).
- Retouching to remove unwanted distractions.
- Sometimes I apply a local adjustment to make the moth slightly lighter such that the pattern on the wings is better visible or it stands out better against the background.
- Sometimes I apply dynamic contrast to the moth for the same reason.
- Finally, I add a soft vignette to put more emphasis on the moth.

These techniques are described in week 9 on page 70 where we discussed improving the images.

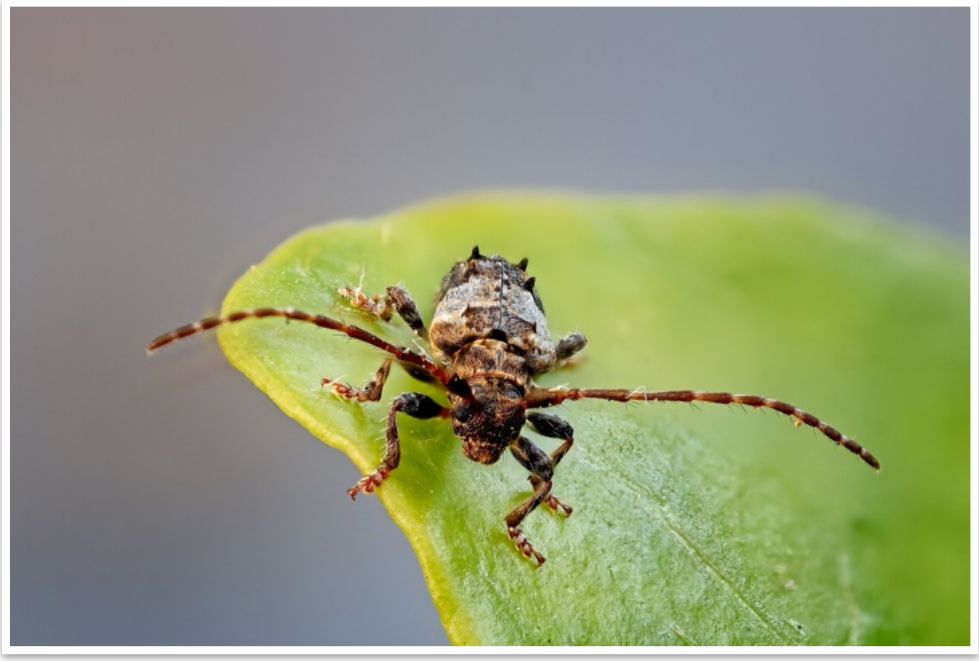
Shot of the week

During my first week of attracting and photographing night moths in my garden, I saw 25 different species. Four of them were rare in the Netherlands: A Delicate (yes, it is really called that way), a Tawny Pinion, a Cotton Bollworm, and this Plumed Fan-foo. That was somewhat surprising as it is rare to photograph a rare insect. It also makes photographing night moths very rewarding. Each time you look at the sheet or in the light trap, there is excitement about what might await you. There are so many species to discover.

100 mm macro lens, 1/320 sec., F/13, ISO 200, flash.

Week 16: Focus bracketing

When you want to photograph a small insect, you need a large magnification. But with a large magnification, the depth of field becomes small, and it is impossible to get the whole insect in focus. The same applies when the insect is large and has protruding wings or antennae. In such situations, you can apply focus bracketing and stacking. This week I investigate this technique in detail.



A beetle, called a Pogonocherus hispidus. Focus stacked from 20 images. 100 mm macro, 1/180 sec., F/5.6, ISO 400.

Depth of field is always an issue when photographing insects. When you use a large magnification or when the insect is large, it is often impossible to get the complete insect in focus. With top-down shots or side shots it might still work, but when you take a shot at an angle or from the front, only part of the insect will be sharp.

As discussed in week 6 on page 41, the depth of field becomes smaller and smaller when the magnification increases. You can increase the depth of field by narrowing the aperture but that is limited and with narrow apertures (higher numbers) the picture becomes less sharp due to diffraction. As an example, the beetle in the image above was about 15 mm long with very large antennae. Even with a narrow aperture, such a shot is impossible to get fully in focus.

To increase the depth of field, you can use focus stacking. With this technique you create several images with the same composition but with different focus distances and combine them using special software, taking only the sharp parts from the different images. The picture above is combined from 20 shots each with a slightly different focus distance.

Below is another example: a grasshopper. Because this insect was in the sun, I could use an aperture of F/11 and, hence, I needed less images to cover the desired focus range. I found this insect dead, so it was easy to photograph it.

A Southern Oak Bush Cricket, combined from a stack of 10 images. 100 mm macro, 1/250 sec., F/11, ISO 160.

The first of the 10 shots focused just in front of the head while the last one focused on the ends of the rear legs. Here are the first, fourth, seventh, and final original shot.

To avoid confusion, let us be clear about the terminology used:

- **Focus bracketing** is the process of taking a set of shots with different focus distances.
- **Focus stacking** is the process of combining this stack of images into a single image.

Many modern cameras, including my Canon R7, have the possibility to do focus bracketing automatically. Some cameras, again including my R7, can also do the focus stacking in the camera and produce a combined image. Most modern Olympus cameras have focus stacking functionality, while the Fujifilm cameras can only do focus bracketing. Also, several Nikon cameras can do focus bracketing, called focus shift, but they cannot do the stacking in-camera. Most Sony cameras have no functionality for focus bracketing.

When your camera supports focus bracketing and focus stacking, you are strongly recommended to learn how to use it. It is an easy way to get insect shots that would be impossible otherwise.

If your camera lacks focus stacking functionality, you can use software to combine the images on your computer. Most photo processing software has functionality for this. For example, in ON1 Photo RAW[17] or Luminar Neo[18] you simply select the images and tell the software to stack them. Photoshop[19] can also do focus stacking, but it is slightly more work[20]. There is also special software available for focus stacking, like Helicon Focus[21] or Zerene Stacker[22].

Two approaches

There are two approaches to focus bracketing. The first approach is to hold the camera at the same position and change the focus distance. This is what cameras use when doing automatic focus bracketing. You can use it handheld if you have a stable hand or when the subject is not too small, but I prefer to rest the camera against something solid.

The second approach is to keep the focus distance the same but move the camera towards the subject while taking the shots, changing the part that is in focus. Focus rails use this approach, but it can also be done handheld. When using this approach, it works best to use manual focus. If your camera has no focus bracketing functionality, this is the recommended approach to use. Set the camera to burst mode, focus on the nearest position, press and hold the shutter button, and move the camera slowly forwards to take the sequence of shots.

Using automatic focus bracketing on my Canon R7 is rather easy. You set the number of images and the focus increment between the images. Also, you indicate whether to combine the images into a single image. Next you focus on the nearest position you want in focus, or slightly closer, and then press the shutter. The images are taken using the electronic shutter at 30 frames per second, so very fast (until the buffer gets full). Unfortunately, you can only save the combined image as JPG. Other cameras with automatic focus bracketing work in a similar way. However, some cameras start at the furthest focus distance rather than the nearest. Check the instructions for your camera.

When you are using in-camera focus stacking, you will sometimes get an error, especially when shooting handheld. There are two types of errors: either there is too much motion, or there is not enough information in the image(s) to combine them (they are blurry and flat). In the first case, try again and hold your camera motionless. In the second case, the result might still be ok. Often you do not need all images to get a nice result.

[17] https://www.on1.com/
[18] https://skylum.com/luminar
[19] https://www.adobe.com/products/photoshop-lightroom.html
[20] https://www.youtube.com/watch?v=bxxD-mS_Meo
[21] https://www.heliconsoft.com/
[22] https://www.zerenesystems.com/

A Noon Fly. The image on the left was taken with a flash, so I could use F/13. The image at the right uses ambient light, F/5.6, and focus stacking.

Initial focus

Assuming you are using a Canon camera, you need to start the focus bracketing at the nearest position you want in focus, or slightly in front of it. This is harder than it may seem. When you use continuous autofocus, which is the preferred mode for insect photography, the moment you press the shutter button to start the bracketing, the camera focusses on the selected focus point, which is often not the nearest one. As a result, the front part of the insect is not in focus in the resulting image. There are three ways to remedy this:

- Change the focus position to the correct nearest point.
- Switch off continuous autofocus, direct the camera at the nearest point, half-press the shutter button, recompose the image, and fully press the shutter button to take the shots.
- Use back button autofocus. In the menu make sure that the shutter button only does metering and no focusing. Use the focus button on the back of the camera to focus on the nearest point, reposition the camera to get the required composition and press the shutter button to take the shots, without refocusing.

I normally use the third solution, and I use one of the custom modes on my camera for the settings for focus stacking.

Avoiding motion

The stacking software can realign the images, so a slight motion of the camera between shots is not usually a problem, but you must avoid motion as much as possible. There are three types of motion that can cause problems:

- Motion of the insect. There is nothing you can do about this. This type of motion cannot be corrected by the software. You can end up with an image where parts, like antennae, are shown double. But small motions are not always a problem. For example, if the insect moves the front legs during the sequence, chances are that the shots that are needed for the legs have already been taken. So, the changed position will not show in the final image.

- Motion of the plant or leaf containing the insect, in particular due to wind. Some sideways motion can be corrected by the software. Motion along the direction the camera is pointing in is more of a problem because it changes the part of the insect that is in focus. As a result, the final image might not be completely in focus.

- Motion of the camera. The best way to avoid this is to use a tripod or monopod, if you have the time to set it up. When shooting handheld, try to find some support to rest the camera against. My experience is that, when the magnification is not too large, handheld focus stacking will work fine.

Exposure

Handheld focus bracketing with a flash is often impossible. The recharge time of the flash is too long, meaning that you must hold the camera still for a very long period and the insects should also stay motionless during this period. Only when you take a small number of images and you use a low flash power, it can work. The automatic focus bracketing on the Canon R7 uses the electronic shutter, which cannot be combined with using a flash, but this might be different on your camera.

If you cannot use a flash, you must work with the ambient light that is available. This normally means you must use a wider aperture. But with focus stacking, that is not a problem. You simply need more images to stack. When it is sunny and the insect is in the sun, I use a shutter speed of 1/125 sec. or faster, aperture F/8 or F/11, and ISO 100–400 depending on the amount of light. When there is no sun or the insect is in the shade, you easily loose 3 or 4 stops of light. To accommodate for that I keep the shutter speed at 1/125 sec. but reduce the aperture to F/5.6 or F/4 and increase the ISO value to the 400–1600 range.

As the in-camera focus stacking produces a JPG file, it is important that the exposure is spot on. As discussed in week 9 on page 70, JPG files have only 8-bit color depth, so you have little room to adapt the exposure in post-processing.

A Common Darter in the sun. It would be impossible to get the head and complete wings in focus without focus stacking. Shot handheld. In-camera combined from a stack of 10 images. 100 mm macro, 1/125 sec., F/8, ISO 160.

Focus increment

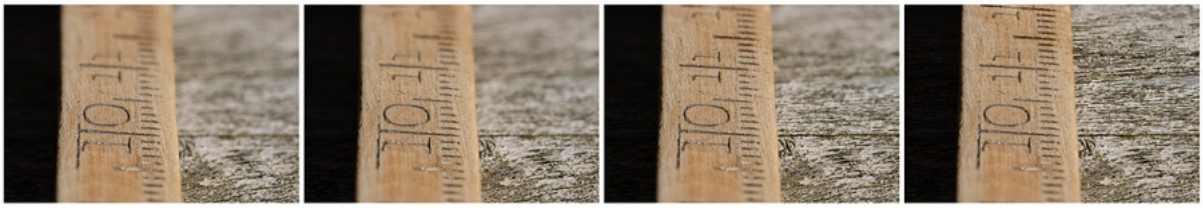
When using focus bracketing, you must indicate the number of images and the focus increment between the images, and sometimes there are further parameters. How this works depends on your

camera model, so better check the instructions or search on the web. Here I use the Canon R7. It uses the following setting for focus bracketing:

- Whether to use focus bracketing. Set this to Enable.
- The number of shots. When shooting handheld, I try to limit this to 10. The smaller the number of shots, the faster the bracketing is finished and the easier it is to hold the camera still.
- The focus increment. This is a magical value between 1 and 10. I set it to 7. See below.
- Exposure smoothing. Leave this to Enable. It will make sure all the images have the same tone and color.
- Depth composite. Leave this to Enable. When disabling, the shots are not combined into a single image. The camera always also stores the individual shots. So, you can combine them on your computer.
- Crop depth comp. Leave this to Enable. When there are slight movements between the shots the final merged image will not cover the entire area. This option tells the camera to crop the outside part.

It is not clear from the Canon R7 documentation what the focus increment value means. It does not represent a fixed distance. The documentation states that the actual change depends on the aperture. The default value is 4.

I ran a lot of experiments using the Canon RF 100 mm macro lens to determine the best focus increment value, using different magnifications and different apertures and focus increments. For example, for a lens magnification of 0.8, aperture F/8 and a focus increment of 1, 4, 7, and 10, using 10 images, you get the following stacked images. Note that the ruler shows centimeters and is at an angle of about 45 degrees.



As expected, the depth of field increases when the increment increases. The following images show an enlargement of the results for increments 7 and 10.

If you look carefully, in the image at the right you will see some bands where the image is less sharp. Three of these bands are indicated with arrows. These bands occur where the images are stitched together. Here they are the least sharp. Focus banding should be avoided as much as possible. The smaller the increment, the less banding you get, but the more images you need to cover the same focus distance range. For handheld shooting of insects, increment 7 seems a good compromise between the number of images you need, and the amount of banding.

When using F/4 (for when the insect is in the shade) the area that is in focus is almost halved compared to F/8. The camera automatically reduces the focus shift distance when the aperture is wider. As for F/8, there is focus banding for increment 10, and for 7 focus banding is hardly visible. For all other combinations I tried the results were the same: focus increment 10 gives focus banding, which a value of 7 does not. So, 7 seems to be the best value to use.

The number of images you need will depend on the aperture and the desired depth of field. The magnification factor also plays an important role here. The smaller the magnification, the fewer images are required. When using F/8, 10 images normally cover the area you need. When using F/4, the depth of field for each of the images is considerably smaller and you will need more images (like 15 or 20) to cover the desired range. When the insect is relatively far away, like with the dragonfly in the image above, you can use less images or a smaller focus increment. You must experiment to determine the best numbers.

A tiny plant hopper (Issus coleoptratus), using a stack of 10 images. Because the insect was in the shades, I had to use 1/90 sec., F/5.6, and ISO 2000.

Artifacts

When focus stacking images some artifacts might occur. I already mentioned the banding above, but there is a more serious issue. Consider the image below of a water strider (but here sitting on a leaf). If you look carefully, you will see that the surface of the leaf is blurred around the legs and antennae, but sharp elsewhere.

A water strider (Aquarius paludum), using a stack of 10 images. 100 mm macro, 1/125 sec., F/4, ISO 2000.

The blurring around the legs is caused as follows. For each position in the final image, the combination software must decide what original image to use. To get the legs and antennae sharp, the software decided to use the data from the corresponding images. But in those images, the leaf is blurred. So, the area next to the legs and antennae gets blurred. At other places, where only the leaf is shown, a sharp image of the leaf is used.

This effect often occurs where there is a jump in distance in the image. In the example image, the legs and antennae are much closer to the camera than the leaf. You can see the same effect in the dragonfly image above. The tail is not in focus because the image for the wing is used.

There are several ways to reduce the impact of these artifacts. First, you should avoid jumps in distance as much as possible. For example, avoid legs or antennae that cross each other or cross the body of the insect. Second, use a background with little contrast, or make sure that the background is completely blurred, like in the dragonfly image above. Finally, in post-processing, you can further blur the background, to make the effect look more gradually.

Focus stacking is a great way to get amazingly sharp shots. And if your camera has the functionality built-in, it is rather easy to use. Remember though, not everything has to be in perfect focus for a nice shot. It can look unnatural. Sometimes it is better to have only part of the insect in focus. It helps the viewers to concentrate on what is important. So, use focus stacking with care.

Shot of the week

Even though this week was about focus bracketing, I also took lots of “normal” insect shots. When walking along some bushes I noticed some red dot from the corner of my eye. Fortunately, I had my camera with me. After quite a bit of searching I managed to locate this tiny beetle that is indeed very red. It is just a few millimeters in size. Because I had never seen such a red beetle before I assumed it would be rare. But that was not the case. It is of the Apion genus and rather common in the Netherlands. But that did not matter. I still liked the beetle a lot and it made for a nice shot; I think.

100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Week 17: Improving your images further

In week 9 on page 70 we looked at ways to post-process your images to improve them. But we just scratched the surface. Post-processing software can do so much more. Here I look at some further functionality that can be used to improve your shots. And I discuss some creative ways to change the images.

My standard process for improving my insect shots consists of the following steps: cropping, sharpening, tone and color enhancement, retouching, adding dynamic contrast, and adding a vignette. Often this is enough to create a nice image. But sometimes you need to apply some further techniques to get the best result. Here I describe some of the additional techniques I sometimes use.

Adding lens blur

When shooting insects, like with any other shot, part of the image is in focus and part is blurred. The area that is in focus depends on the aperture and the magnification factor. For most shots you prefer (part of) the insect to be in focus, and the background to be blurred. This will put the emphasis on the insect and adds a feeling of depth to the image.

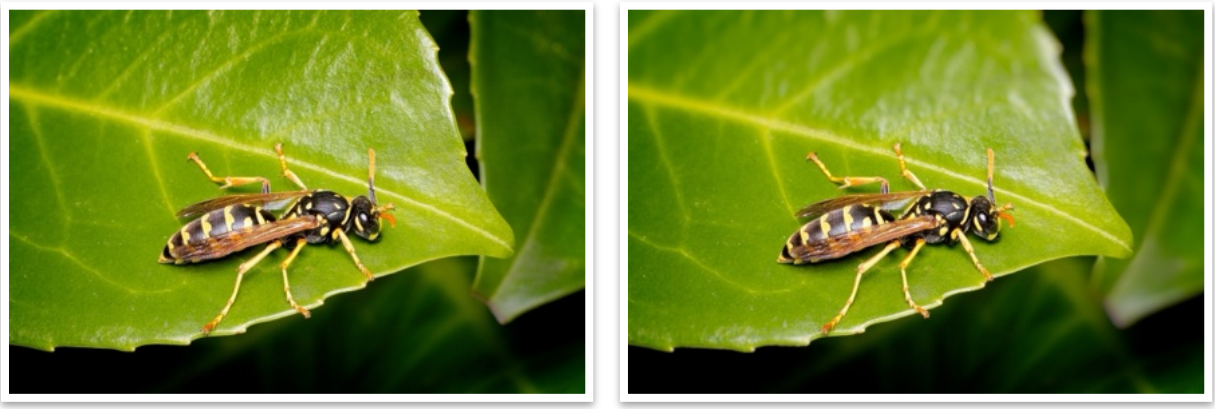
When the background is too close to the insect, it will also be sharp. Or when there is a branch next to the insect that branch might also be in focus, distracting the viewer. The best solution is obviously to try to take the shot in such a way that the problem does not occur, but sometimes that is impossible, and you still want to photograph the insect.

In such situations you can add lens blur in post-processing. Image processing software has filters for this. You create a mask to indicate which part of the images should be blurred. Often a gradient mask is used to gradually increase the blur in a particular direction. Lens blur can be used in the following situations:

- To create depth by using a gradient blur, often vertically, to the background.
- To put more focus on the insect, by blurring the rest of the image slightly. You can use this in a similar way as applying a vignette.
- To put less emphasis on distractions by blurring them. You can also desaturate distractions or darken them. All these techniques make them less prominent.

The important parts of the insect should obviously stay sharp.

Here is an example. In this image of a European Paper Wasp, the leaf behind the insect was almost vertical. As a result, the whole leaf is in focus. I should probably have used a slightly wider aperture to avoid that. By using a lens blur filter with a gradient mask, on the top half of the image, more depth is created, and the focus lies more on the insect. Also, the leaf in the background was blurred a bit to put less emphasis on it.



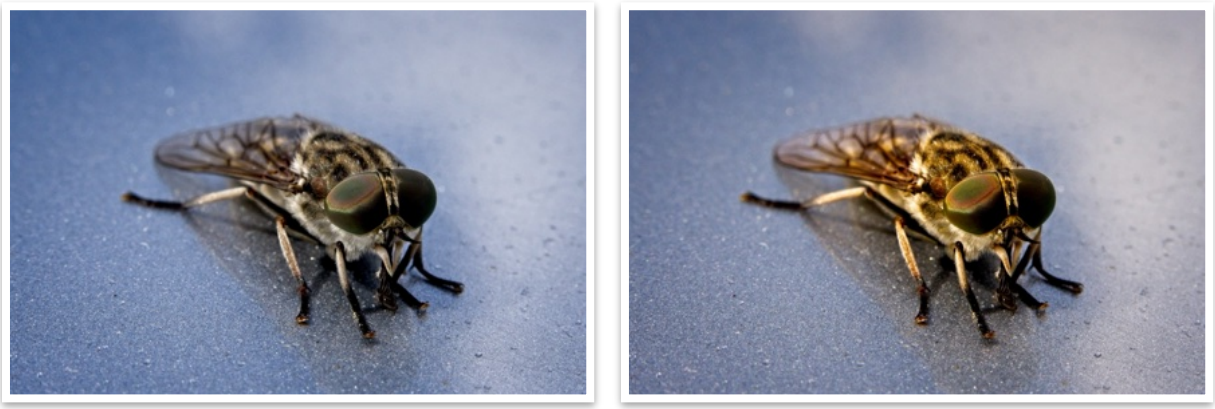
A European Paper Wasp. In the left image the leaf he is sitting on looks very flat. In the right image the top half is blurred, creating more depth. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Sunshine

When you shoot insects on a cloudy day or in the shade, the colors do not show very nicely. The images become a bit dull. With a flash, that is less of a problem, but without a flash some post-processing will help to improve the image. You can try the following steps:

- Adapt the color temperature (the white balance) to make the image slightly warmer.
- Add a bit more vibrance to the image.
- Add some sunshine to your images. Some software packages, like ON1 Photo RAW, have filters for this. In other packages you must do this yourself. This normally involves using a luminosity mask to selectively lighten the image and warm the colors. Basically, you are making the lighter parts lighter and more vibrant, while not changing the darker parts.

You can also apply such changes and filters only to the insect, using a mask. This separates it more from the background.



A Large Marsh Horsefly on a cloudy day, no flash. At the left the original image. At the right the color temperature was increased, and a sunshine filter was applied to the insect. 60 mm + 31 mm tubes, 1/250 sec., F/13, ISO 320.

Focus stacked images

Images that are created using focus stacking need some special care. My camera stores these images as JPG files and has already done some basic processing on them, like correcting the white balance and sharpening them. But further processing is recommended.

I prefer to have sunlight when using focus stacking. It allows me to use a reasonable aperture and a not-too-high ISO value. But photographing in sunlight comes with a serious problem: shadows. When you take a shot at an angle, some parts of the insect might cast a shadow on other parts. In this situation I often use some local adjustments to lighten up certain areas. For example, I might lighten up the eyes of the insect a bit. Be careful that you mask correctly. Better stay a bit inside the area and use enough feathering on the masking brush. Don't lighten it too much. As these are JPG images you do not have much color depth to work with. If the shot is taken in the shade, I add sunshine in the way described above. I often also sharpen the images a bit.

As indicated in week 16 on page 120 where we discussed focus bracketing, there are often artifacts where, for example, parts of the background near the insect are blurred, while other parts are not. The best way to solve this problem is to also blur some other parts of the background. Focus stacking can sometimes put too much of the subject in focus. In such a case it helps to blur some parts of the insect a bit.

Here is an example showing all the steps (besides cropping and retouching). I sharpened the image, added sunshine, lightened the eyes, and blurred some parts where there were artifacts. Also, I blurred the leg along the right edge. It was too sharp, which distracted the viewer.

A Common House Spider. Shot with focus stacking. At the left the original JPG image and at the right the processed image. 100 mm macro, 1/125 sec., F/6.7, ISO 250.

Removing flash artifacts

Insects and the leaves they are on are often shiny. As a result, there can be many shiny, white spots in the image where the light was reflected. The sun produces such spots, and the flash has a similar effect. There are some ways to reduce the white spots in post-processing, but you can never get rid

of it altogether. In the bright shiny spots, there is simply not enough structure and color information to completely remove them. Here are some steps you can take:

- Decrease whites and highlights, and then increase exposure a bit to compensate.
- Don't apply sharpening globally, but only to the relevant areas that are not too shiny.
- Reduce the structure or detail of the image when you image processing tool has a feature for this. Use a local adjustment to reduce structure in only the problematic areas. You can also reduce the haze or fog in the image when your tool has a feature for this.
- Apply dynamic contrast only to the areas without shiny parts.
- Reduce the dynamic contrast at shiny areas.
- Desaturate the shiny areas a bit.
- Add a bit of blur where this is possible.
- When your leaves are too shiny, you can change the green color of the leaves into a bit more yellow and you can make the color brighter. This with reduce the contrast with the shiny parts.

Here is an example of a midge on a very shiny leaf. The left image is processed using my standard process, described in week 9 on page 70. In the right image I applied the techniques described above, exaggerating a bit to show the effect. With an image like this it is impossible to remove the shiny areas completely, but you can make them less distracting.

Removing the shininess of the leaf in an image of a midge. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Artistic effects

I normally try to make my images look natural. All the changes I make aim to enhance the image, but not really change it. It is also possible to create more artistic images. Here are some examples.

Mirroring

As explained in week 8 on page 61, images with symmetry are appealing to many viewers. And insects work great for this. You can take this a step further and create perfectly symmetrical images in post-processing, by taking one half of the insect and mirroring it. To apply this, you must start with an image in which the insect is already (almost) symmetrical. Best use a top-down shot or a shot from the front. You can now proceed as follows.

- Do some global processing to improve the image. Don't do any clipping or vignetting at this stage. When required, apply some retouching on the half you want to keep.
- Shift and rotate the image such that the symmetry line is exactly vertical and in the center of the canvas.

- Duplicate the single layer. So, you will have two identical copies. Make the bottom layer temporarily invisible.
- Mask half the top layer away. Keep the side you want to use. Use a small gradient in the mask, such that both sides will nicely blend.
- Mirror the top layer. Now make the bottom layer visible again. You probably must shift the top layer slightly to get the perfect match.
- Merge all layers into one. Do some final processing on the resulting image, like cropping, adding a vignette, and maybe some further retouching, especially in the center where the two halves meet.

Below you see two examples that use this mirroring technique. The image on the cover of the book was also created this way.

Mirrored images of a top-down shot of a Green-veined White and a head-on shot of a Comma. Butterflies are insects for which this technique works very well.

Colors and textures

Image processing software has tons of creative and artistic filters. Insects are a good target for such filters. They are a bit unusual, and by adding creative elements you can emphasize that.

You can get interesting effects by playing with the colors. The Scarlet Darter is a dragonfly with a very distinct red and orange body. To emphasize that, I remove all other colors from the image using a color enhancer filter. Also, I strongly increased the highlights and whites, to give the image a dreamlike atmosphere. No masking was required for this.

A Scarlet Darter. To emphasize the red color, all other color was removed from the image.

Making images black-and-white, or monochrome, can make them stronger. Contrast is often exaggerated, leading to a somewhat uncomfortable feeling. A spider already has that emotional effect on people, and a black-and-white filter enhances that effect. You can also use black-and-white filters to create a vintage look, for example by adding film grain.

A Silver-sided Sector Spider. The image at the left is in black-and-white with strong dynamic contrast. The image at the right is monochrome and adds film grain and a white vignette for a vintage look.

The following image of a shield bug is processed more. First a texture with leaves was added. The texture was masked such that it did not appear on the bug itself. Next a LUT was used to adapt the colors. LUT stands for lookup table. It provides a mapping from original colors to new colors. This can be used for all sorts of effects. Finally, a strong white vignette was added.

A shield bug called Arma custos. This image adds a texture, adapts the colors using a LUT, and adds a strong white vignette.

These are all examples where the insect is largely unchanged, and the result is still clearly a photo, but with artistic filters you can go a lot further. For example, below is a cartoon rendering of a Red Admiral butterfly, using the free GMIC plugin[23] that contains over 500 filters.

Cartoon rendering of a Red Admiral butterfly using the GMIC plugin.

[23] https://gmic.eu/

Because there are so many possibilities you are strongly advised to first think about what you want to achieve before you start processing your shots in artistic ways. Just playing around will be fun, but often it will not get you anywhere interesting.

Shot of the week

When attracting night moths using a lamp and sheet, sometimes beetles appear as well. They are active at night and are attracted by the light. This scarab beetle, called a Aphodius rufipes, showed up one night. It is common in the Netherlands, but you do not see it often during the day because it hides from the light, preferably in dung. The beetle was about 12 mm long. When I tried to photograph it, it decided to fly away, and opened its cover to release its wings. It gave me about one second to take this lucky shot, before it took off. It is amazing to see how its large wings unfold from underneath the covers.

100 mm macro lens, 1/320 sec., F/13, ISO 200, flash.

Week 18: Identifying and sharing

During my journey I have taken thousands of insect shots, and I started to wonder what to do with them. An important first step was to throw away all the poor ones (and most were poor) and carefully organize the remaining shots. Otherwise, you will never find them again. I also wanted to know the names of the insects, and whether they were common. And I soon found many places where you can share your work and get feedback.

A White Ermine moth. In Dutch it is called a white tiger. Knowing the names of the insects adds a dimension to your shots and helps finding them back later. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Organizing your shots

When you take many shots, it is crucial that you organize them in a way that you can find your photos back. Otherwise, the whole collection becomes useless. I use a strict process for this. I use ON1 Photo RAW to organize my shots, but Lightroom and other photo organization software has similar functionality. This process consists of two phases. Soon after I take the shots, I do the following:

- I import all the images and place them in a “To Be Processed” folder.
- I go over this folder and throw away all shots that are poor. I am very strict here. I often take 10 or more shots of the same insect, and I normally keep one or at most two of them. I only

keep shots that are good enough to show to people or are interesting in a different way. (I keep a backup of all shots I take on a remote SSD, but I don't expect to ever look at them.)

- The shots I keep I give a star rating as follows:
    - One star: A poor shot that is interesting for other reasons, for example, because it shows a rare species.
    - Two stars: A reasonable shot that I might be able to improve with enough work. If I have no better shot of an insect, I keep one with a two-star rating.
    - Three stars: A good shot. I plan to do post-processing on these. I might use them in one of my articles, post them on social media, or show them to other people. An afternoon of shooting insects normally results in just a hand-full of three-star images.

  I don't give four or five stars at this moment. I only do that after post-processing. But the meaning is as follows:

    - Four stars: An excellent shot that I might want to print and that I put in my portfolio.
    - Five stars: An exhibition quality shot. (Never used that up to now.)
- I try to determine the names of the most interesting insects. Once I identified an insect, I add the name as a keyword, and give the photo a special mark.
- I now put the images in a different folder, named after the month in which I took the shots.

This all should take just a little bit of time. When I have more time, I do the post-processing.

- I look for some three-star images that have not been processed. I apply post-processing to them and give them a special color mark to indicate that they are processed.
- The ones I really like after post-processing, I give a four-star rating. Sometimes, after trying to improve the image, I am not happy with the result. In such a situation I reduce the rating.
- I also export them as high-quality JPG files, such that I can use and share them.

Before I use a photo, I take another look at it and might do some additional post-processing on it to improve it further. Doing post-processing twice tends to lead to better results. The first time you compare the processed image with the original. The second time you no longer consider the original image and only look at the quality of the final image.

In this way I can always find the shots I am looking for. I can use the keywords to look for a particular insect. I can use the rating to find the best shots, and I can use the color mark to know whether it is "ready". The shots have a GPS location, so I can easily find out where they were taken. I can also make selections based on location and date.

A rare plant bug, called Dicyphus bolivari. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Identifying insects

When you know more about your subjects, they become more interesting. For example, the plant bug in the image above originally came from the Canary Island. It was first spotted in the south of the Netherlands in 2018. Since then, it is slowly moving north, probably due to climate change. In 2023 there have been several sightings everywhere in the Netherlands, but it is still considered rare. I found this one in my garden.

In the past, identifying the insects you photographed was difficult. There were extensive guides and you had to carefully inspect many aspects of the insect. An additional complication was that insects can change a lot during their lifetime. They can grow wings, their colors can change drastically, and so on.

Nowadays identification has become considerably easier. There are websites and free apps that do the identification automatically. You upload one or more images of the insect, together with the location where they were shot, and the site or app tells you what insect you are looking at. These sites are built by and for scientists that use the information to learn more about the world-wide distribution of certain species. They use AI and databases of many millions of images to do the identification.

They are not always perfect. Sometimes they give strange suggestions. So, you best verify the results by looking at the many photographs they provide. Strangely enough, high quality insect photos, shot with a good camera and a macro lens, sometimes perform worse than images shot with your mobile phone. The reason is that most of the images on these sites are shot with mobile phones and, hence, the AI algorithms are trained on such shots. Also, using a flash can reduce the success rate.

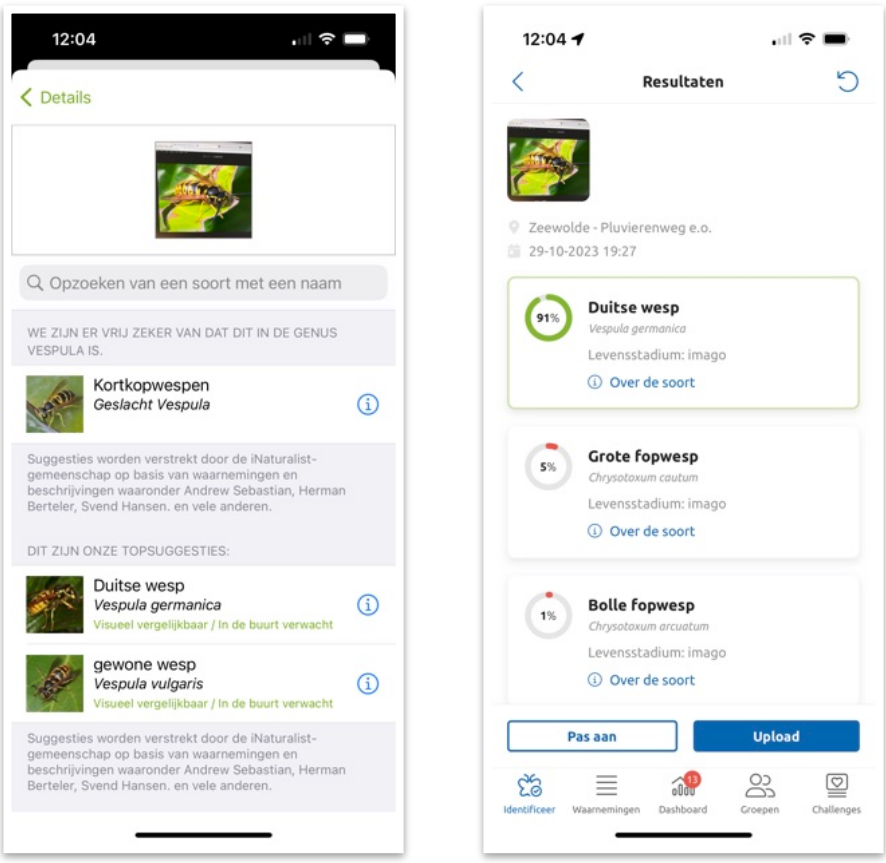
iNaturalist[24] is the most popular app and website for identifying insects, and other organisms. It is completely free. You best create an account. After this you can use the app or the website to upload photos (called observations). The app will give suggestions about what it thinks the insect is. Select

[24] https://www.inaturalist.org/

the correct one, and the observation is stored. The app and site are very extensive. You can see observations by yourself and others, get lots of information about the insects, see distributions on maps, and so on.

Because it is so extensive, it is also a bit overwhelming and somewhat difficult to use. There is a simpler version of the app, called Seek. It is more focused on minors. This app is easier to use, and it stores the data only on your local phone. The data is not shared with scientists and others around the world. The app contains more game-like elements, like badges and challenges.

I prefer **ObsIdentify**[25]. This is a free app connected to the site https://observation.org/. There is a special version at https://waarneming.nl/ that focuses on insects in the Netherlands, which I use. It has similar functionality as iNaturalist, but it is slightly easier to use. The main reason for using this app though is that it is focused on the Netherlands (and Belgium) and has many more observations than iNaturalist. That makes the identification better, and the information more interesting. Also, ObsIdentify gives a confidence rating for each suggestion, which is very useful. When the rating is above 90% it assumes the observation is certain. (But better check. It can be wrong.) The site and app also contain lots of information about insects.



The apps iNaturalist (left) and ObsIdentify (right), identifying a German Wasp (in Dutch). iNaturalist gives the genus and suggests species. ObsIdentify suggest species with a confidence rating.

In ObsIdentify, initially, your observations are verified by experts. In this way, they make sure that you indeed upload correct information, which is important for the scientists that use the data. Your observations are still visible to yourself, but they are not used in distribution maps and at other

[25] https://observation.org/apps/obsidentify/

places, until they are verified. After a month, when your observations are good, you become a normal user and your observations are used, unless you indicate that an observation is not certain.

Adding your photos to one of these apps or sites can be rather addictive. You hope to find rare species and it is rewarding to see the total number of different species you saw, go up. I have now uploaded all my sightings of 2023. In total, I photographed close to 400 different species. There are 40.000 different species of insects in the Netherlands, so I am now at 1%. Quite a way to go.

Sometimes, the apps fail to identify the insects. This regularly happens with insects for which there are few sightings. I like to photograph small insects and for these the number of sightings is often small. In that case you can turn to social networks. There are many Facebook groups on insects. Here specialists are willing to answer your questions about the insects you found. Best use a group dedicated to your country or region as insects are different in different parts of the world.

Sharing your work

When you take nice photographs, you best let others enjoy your work. Social media is a perfect place for this. You can post your shots on your Facebook or Instagram pages. But what works better is to post them in one of the many Facebook groups on insects or macro photography. Such groups can have tens of thousands of members.

A close-up of a wasp, called Ophion obscuratis. Posting images like this on Facebook groups often leads to nice reactions and encouragements. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

When you become a member of a group on insects, and post images there, it is best to pick a group that focuses on insects in your region. Often, they only allow shots of insects that come from that region. These groups are also perfect for asking questions about the insects you shoot. The focus here is often not so much on the quality of the picture, but more on the insects themselves. But people appreciate good shots, and you often get positive comments. My experience is that people

are very friendly in these groups. I post regularly on the Dutch groups *Insecten*[26] and *Insecten fotografie*[27].

Groups on macro photography are also a good place to showcase your work. Some focus on insects, while others are more general. Watching the images of others is a good way to learn how to improve your own work. People in general are friendly, although occasionally there can be debates about whether a shot qualifies as a macro shot. I frequently post on the groups *Macro*[28] with 350.000 members, and *Just Macro*[29] with 60.000 member. You quickly have a large audience.

Finally, there are groups dedicated to the equipment and software you use. I regularly post in groups on *Canon R7 Shooters*[30] and the *On1 Photo RAW User Group*[31]. Here people appreciate it when you provide details about the equipment and settings you used and how you processed your images.

Some advice: Be active in a select number of groups. Regularly post your work, but not too often. I normally do one post in each group every two or three days. Also comment on the work of others. Always try to be friendly and positive about other people's work. Soon you will become a valued member.

Shot of the week

I found this thread bug using the pizza box method described in week 14 on page 106. In the Netherlands there are two types. The relatively common Empicoris ragabundus and the very rare Empicoris rubromaculatus. The difference is hard to spot. The rare species has two white stripes at the sides of his body, just behind the head. I posted the left top-down shot to a Facebook group on insects. The stripes are hardly visible there. In the group, an expert pointed out that for proper identification you needed a side shot that shows the stripes. Fortunately, I also had the shot at the right. Not such a nice shot, but it clearly shows the white stripe. So, we could indeed determine with confidence that this was the very rare species.

100 mm macro, 1/320 sec., F/13, ISO 200, flash.

[26] https://www.facebook.com/groups/1112038215575404
[27] https://www.facebook.com/groups/549971008831053
[28] https://www.facebook.com/groups/660491344082992
[29] https://www.facebook.com/groups/Macrophotos
[30] https://www.facebook.com/groups/canonr7shooters
[31] https://www.facebook.com/groups/On1PhotoRAW

Week 19: A butterfly garden

In winter, there are few insects around. So how can you still photograph them? There are butterfly gardens all over the world. Here you find beautiful tropical species. Most of these gardens you can visit during the winter, and when you are prepared for the heat and humidity inside (both yourself and your camera) you can take some great shots.

At the end of October there are hardly any flowers left in the Netherlands. Most insects have done their work, which is reproduction. Most of them die. Some find a sheltered spot to survive during the winter. Their eggs or larvae are hidden in the ground or water to create a new generation in the spring. There is no point anymore going out to shoot insects because there are very few left, and you see the same ones all the time. So, what to do?

There is almost certainly a butterfly garden somewhere near your place. Most butterfly gardens only have tropical butterflies, so these are clearly not the insects you see during the summer. Even though I prefer to shoot Dutch butterflies this is a good alternative. I visited several butterfly gardens in the Netherlands. The images in this article are from my visit to Pantropica[32], formerly called the Orchideeënhoeve. Besides butterflies, that facility also contains lots of flowers, birds, monkeys, and other animals.

This Malachite was sitting on a bench. It looks beautiful with its wings closed. 100 mm macro, 1/320 sec., F/11, ISO 200, flash.

[32] https://pantropica.nl/

Equipment

Taking shots in a butterfly garden requires somewhat different equipment. Because you must stay on the walkways, you often cannot get very close to the butterflies. So, you need a longer lens. I used my RF 100 mm macro lens, but sometimes I wished I had my 100–400 mm telephoto lens with me. You do not need a macro lens. Most butterflies are large enough to photograph with a regular lens.

It can be rather dark in these covered gardens. So, a flash will help. But make sure that this is allowed. Photographing is normally not a problem, but a flash might be. Ask the staff if you are not certain.

The same holds for using a tripod. Not all gardens allow you to use one. Pantropica is rather relaxed in this respect. Their policy is that you should not disturb other visitors. So, using a tripod in the middle of the walkway is not a good idea, but a flash is not a problem.

A Large Owl butterfly. When he opens his wings, he is blue, but he never sits down with his wings open and photographing them flying is almost impossible. 100 mm macro, 1/320 sec., F/11, ISO 200, flash.

Humidity

A serious problem in these butterfly gardens is that they are very hot and humid. If you enter them from the outside, your lens easily fogs up. You must let your camera and lens adapt to the temperature. Best use a weather sealed camera and lens. Otherwise, you run the risk that moisture gets into the camera and fogs it up internally. You cannot wipe that away and it can damage the camera. Never change lenses in such conditions!

Also, if you use a filter, like a protective UV filter, better remove it from the lens. Fog will appear between the filter and the lens. If you still have some fog on your lens that is not a big problem. Some minor fogging can easily be removed in post-processing.

In Pantropica you first walk through a large area with animals and tropical plants. This is warm but not as humid as the butterfly garden. So, by the time you enter the butterfly area the camera and lens are already of the correct temperature and there is little or no fogging.

Behave yourself

As a photographer you can be selfish. You want to take that perfect shot, so you stand in front of a butterfly trying to photograph it at many different angles and waiting for it to open its wings. You try different settings, check the results, and take more shots. You easily forget that you are not alone. Other visitors also want to look at the butterflies. Give them the opportunity, and don't block the walkways. Best visit the place at a time when there are few other visitors.

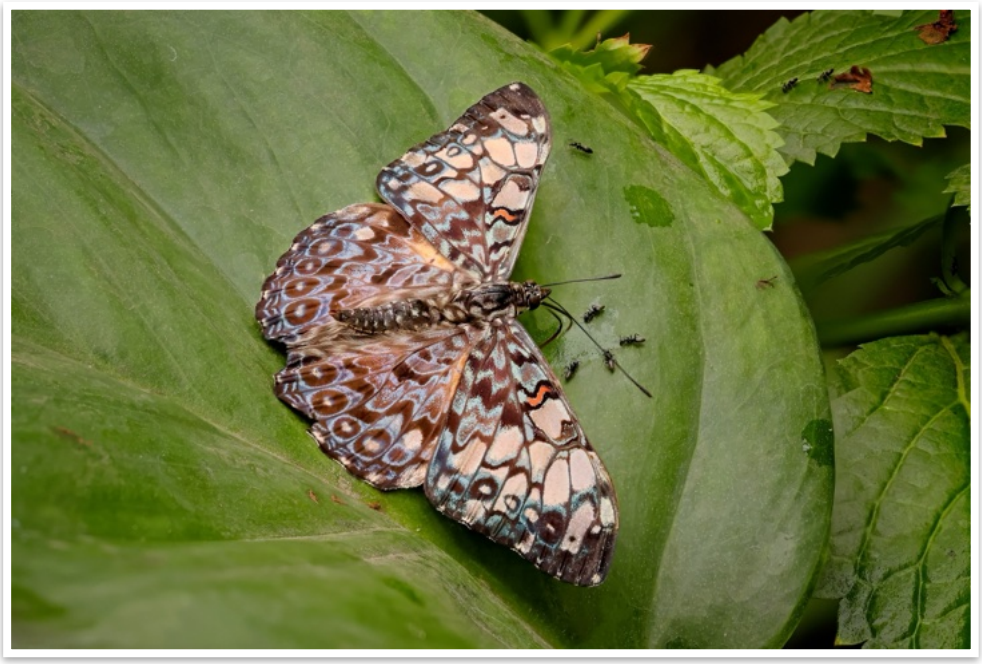
Also, keep on the walkways. It is tempting to try to get closer to some nice butterfly by standing between the plants, but this is clearly not allowed. Don't touch the butterflies or blow air at them to try to make them open their wings. Respect the environment, even though it is artificial.

A Catonephele numilia. This butterfly was sitting rather high, so I had to lift the camera and use the tilted screen to position the shot. 100 mm macro, 1/320 sec., F/11, ISO 200, flash.

Finding the butterflies

You might expect it to be easy to find butterflies in a butterfly garden, but that is not the case. Butterfly gardens are often large with high ceilings, and most butterflies fly around, which is not good for photography. So, you must look carefully at every plant, bench, pillar, and so on, to find butterflies that don't move. It is surprising how easily you miss them, even though they have bright colors.

Approach them carefully. You might think that butterflies in these gardens are used to people, and don't fly away, but that is not the case. Their behavior patterns will be different on days when there are no visitors versus when there are many visitors. Each morning, the butterflies will not know whether the garden will be open or closed, but if no visitors arrive within a couple of hours of the usual opening time, they will alter their behavior.



A Gray Cracker. Combined in-camera from a stack of 10 images, to get it sharp from wing tip to wing tip. 100 mm macro, 1/180 sec., F/4.5, ISO 1250.

Focus stacking

Because it is rather dark in these gardens, if you cannot use a flash or want some more natural light, you must open the aperture. This will reduce the depth of field. When you shoot a butterfly from a distance this is not a problem. But when you take a shot from close range or use a large zoom, it is impossible to have the complete insect in focus.

Another stacked image, of a Polydamas Swallowtail. Normally, shots from behind are not very nice, but here it helps to show both the front and back of the wings. 100 mm macro, 1/180 sec., F/4.5, ISO 1250.

When you need a larger focus range, you can try to use focus stacking. But as you are normally not allowed to use a tripod, you must do this handheld. Fortunately, for these large butterflies you don't need a large magnification, and there is no wind, so this is relatively easy. But it becomes difficult when you zoom in a lot. Better find some support in such a case. The two images above are examples of focus stacked butterflies. Note that the aperture was only F/4.5 and I needed to use ISO 1250. That was all I could do with the available light.

Shot of the week

Even though I knew the number of insects was declining, one day at the end of October I decided to visit a nature garden I had been earlier during summer. It used to be full of insects. But this time it was very disappointing. There was nothing interesting to photograph. But when I went outside it and walked back to my car, I noticed a plant next to the path that still had some yellow flowers. And on it I noticed some insects. After close inspection it turned out there were at least 10 different species on it, including this Knapweed Rhopalid that I had not photographed before. Never give up and always keep looking for something interesting.

100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Week 20: Prepared insects

One way to photograph insects during winter is to use prepared insects. You can either collect and prepare them yourself or you can buy them from various internet sites. Shooting prepared insects indoors gives you full control over the environment. But making them look nice requires some additional work.

If you catch and conserve some insects during the summer, you can prepare and photograph them indoors during winter. Once you start looking for dead insects you find them everywhere. Or you can catch the insects and kill them, either using acetone-based nail polish remover or by putting them in the freezer. Whether or not it is acceptable to kill insects to photograph them is a controversial topic that I am not going to get into. It is up to you whether you consider that acceptable.

Preparing insects

Hard insects, like bugs and beetles, you can dry. Soft insects you best preserve in 70%-80% ethanol alcohol. Now comes the difficult work. You must clean the insects (especially when you find them dead) and you must make sure the insects have their legs and antennae in natural positions. You must relax them, as this is called. To achieve this, moisturize them, use pins to put them in the correct position on a piece of foam, and let them dry again in that position. If possible, don't put a pin through the body, as most bug collectors do. That makes photographing them much more difficult. Instead, glue a thin black pin to the bottom of their body. You can use the pin to manipulate the insect, and it is easy to remove it from the image in post-processing. If you want to know more about this, search the web for information about preserving insects. Or watch the video on *How to Relax an Insect for Photography* by Allan Walls[33].

I was lucky enough to know somebody that used to prepare insects. So, I did not have to learn to do this myself. You might find such a person in nature groups or on social media. He gave me the collection of old dried insects shown in the image below. Many of these were more than 50 years old, but they still made nice subjects for photography.

[33] https://www.youtube.com/watch?v=gUEtmaiHi1Q

A box with prepared insects that I got. Some are more than 50 years old.

Photographing the insects

It is great fun to try to photograph prepared insects. Make sure you have good lighting or use a diffused flash. Because you can work indoors and you have all the time in the world, you can set up the lighting in exactly the way you like.

Put the insect against a contrasting background. Because most of these insects are rather dark, I often use a simple white piece of paper. You can also suspend the insects in the air. You can buy special macro clamps that you can use to hold the insect, using the pin. But you can also use some clothespins.

You can try to make the background more natural, for example by putting the insect on a leaf. But most of the time it looks unnatural anyway, so you better make the background and composition such that you focus the viewer on the interesting parts of the insect.

The insects I got had a pin through them. I put this pin through a sheet of white paper into a piece of foam. In this way, the insect “sits” on the paper. I like that view because you will get a soft shadow on the paper, as the images in this chapter show. You might have to remove the pin in post-processing. Better make sure you photograph the insect in such a way that this is easy. If the pin crosses an edge or piece of detail of the insect, removing it becomes a lot harder. You can also try to take the shot such that the pin is not visible at all.

Best put your camera on a tripod. In that way you can precisely control the composition. Because nothing is moving, you can use a long shutter speed and, hence, a narrow aperture for a large depth of field. You best focus manually as you have full control over the situation. Use depth of field preview, if your camera has that feature, to see the exact depth of field. Or take some test shots.

When prepared insects get older, they lose a lot of their color. Many of the ones I got were 50 years old. So, most color was gone, and they were all rather dark. But that is not a problem. If you cannot use the color, you should focus on the shape and patterns. For example, consider the dragonfly in the image below. There is little color left, but the patterns in the wings are perfect. By putting the

insect on a piece of white paper, with its wings spread out, you can see this intricate pattern in all detail. Also note that the pin is no longer visible. I removed it in post-processing using automatic retouching.

A dragonfly of 50 years old. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Focus stacking is considerably easier when working with prepared insects from a tripod. You can use stacks of many images, with a small focus increment, for perfect sharpness. Some people use a motorized focus rail for this, but I simply used the focus bracketing and stacking in my camera. Here is an example of a male Stag Beetle. This is the largest beetle in the Netherlands.

A Stag Beetle. This specimen was found dead and was then conserved. Focus stacked with 10 images. 100 mm macro, 1/125 sec., F/6.7, ISO 250.

Buying insects

If you don't want to catch and prepare insects yourself, and you do not know somebody who does, an alternative is to buy preserved insects. There are many internet sites for this. Most are directed towards collectors and offer special, and sometimes very expensive specimens. Others are more directed towards people who want to use insects for artistic purposes or to frame them. You are recommended to do some research to find out where the insects came from and how they were caught. Some sites make clear that their specimens are ethically sourced, but for others this is not clear at all. Allan Walls made an interesting (but very long) video comparing the vendors of insects[34].

I tried this out and bought some insects from the British company BugsDirect[35]. The cheapest ones are the unmounted insects. You can buy a pack of 10 assorted insects for 35 euro. If you buy specific insects, they are much more expensive. I got the following package of insects, all carefully packaged. To be precise, there were eight insects, a spider, and a scorpion. The largest one was a cicada, the Tosena splendida, from Thailand, with a wingspan of 13 cm, while the smallest one was just 3 cm in size. Clearly, these insects have been selected based on size, shape, and color. There was no information about the names of the species. Figuring this out was hard because the identification apps take your location into account, and I did not know the location where these insects came from. Google Lens sometimes worked well though.

A collection of 10 assorted, individually packed insects from BugsDirect.

The quality of the insects was rather good. There were no missing limbs or antennae, although you must manipulate them very carefully, otherwise parts will break off. Some looked a bit squashed, with the legs flat to their sides. To get them back into shape, you need to relax them again and put them in a more natural posture.

[34] https://www.youtube.com/watch?v=ebtDvNjoCEs
[35] https://www.bugsdirect.com/

These insects have all been dried to save them from rotting. When you store them, it is important to keep them dry. I put them in a closed container with one of these silicone gel packages that you often find when buying products. That will help absorb moisture and keep the insects in good condition.

It is fun to photograph these insects because of their nice colors and shapes. Their size makes it easier to get close-up shots. Here are two shots of the Flower Beetle from Thailand. From the side shot you can see that the legs are not in a very natural position. The close-up of the head does not show that problem.

A Flower Beetle (Torynorrhina flammea) from the collection of bought insects. A side shot and a close-up.

With such insects you can try out many different things. For example, it is fun to play with lighting. The large Tosena splendida cicada in the pack has beautiful, partially transparent wings. One way to show such wings is to use backlighting. Put a glass plate (or transparent plastic) on two supports (like books) and place a light under it. I used a LED panel. Next, put a piece of white paper on top of the plate, to get a nice and even backlit white surface. Place the insect on top of this. The light now shines through the wings.

Unfortunately, this particular insect has a thick body. Using backlighting, the body becomes almost completely black. To solve that, I place a smaller directional LED light about the insect. (Just a simple desk lamp.) That brought back some of the detail and color in the body. In post-processing I used a local adjustment to lighten up the body a bit more, resulting in the image below.

A Tosena splendida cicada, backlit. 40 mm, 1/125 sec., F/6.7, ISO 160.

You can also photograph small details, leading to abstract photographs, where it is no longer obvious what is the subject. Insects have many beautiful patterns and colors that you can use for this. You will need a large magnification though, so best use a macro lens and/or extension tubes and a close-up lens. Here is a detail of the wing of the Tosena splendida cicada, again using backlighting.

An abstract picture of a detail of the wing. 100 mm macro, 1/125 sec., F/6.7, ISO 800.

Extreme macro

When the magnification factor becomes larger than 2, people often speak about extreme macro. For extreme macro you must work with a tripod, and the slightest bit of wind or insect motion will cause

trouble. So, you best work inside with dead insects. Good lighting is important. Framing the insect is not easy. A minor movement of the camera or the insect will move it out of sight. So, you must move very carefully. Don't use image stabilization. It will make framing harder.

A close-up of the head of a bug. This shot used a magnification factor of 6. 400 mm + 31 mm tubes + Raynox DCR-250, 1/60 sec., F/32, ISO 2000.

At these magnifications, the depth of field becomes extremely small. This means that you either need a very small aperture (large F-number, like F/32), or you need to use focus stacking. Focusing becomes very hard. You must use manual focus in such situations. Always use a remote control to avoid motions of the camera or use the self-timer of the camera to take the shot.

The image above was created using a 400 mm telephoto lens with the Raynox DCR-250 close-up lens. I also added my 31 mm of extension tubes. This gave me the maximal possible magnification I could get with my equipment. The magnification factor was 3.75 which, on an APS-C camera, effectively became 6. I used a bit of digital crop. The width of the area shown in the image is 4 mm. Because I used a very narrow aperture of F/32 and worked with an APS-C camera, the depth of field was just enough, without the need for focus stacking.

Extreme macro is fascinating and can lead to amazing images. But it is also very difficult, requiring the best equipment and a lot of patience.

Shot of the week

This final shot of the week is special. It is clearly not the best shot from a photography point of view. But the topic of the shot is very interesting. There are only a few insect species that give live birth to their children, which are called nymphs. Aphids are one such family of insects. A typical life cycle starts with females without wings giving live birth to female nymphs. These nymphs are already pregnant. No males are required at this stage. Later in the season, females get wings to colonize new plants. In autumn normal sexual reproduction occurs involving males, and eggs are laid. These eggs hatch after the winter, and the cycle repeats itself.

This picture shows an aphid giving live birth, with one nymph already born and the next one on its way. What is even more special is that the mother has wings, which is normally not the case when giving birth.

Shot with my 100 mm macro lens, 1/60 sec. (that was an error), F/13, ISO 200, flash.

Lessons learned

After twenty weeks of shooting insects three or four times a week, the insect season in the Netherlands was largely over. While shooting over 15,000 pictures of insects, I learned a tremendous amount, which I have tried to share in this book. Here is a summary of what I learned.

When I started my journey, I had lots of questions about insect photography. You probably had similar questions. During my weeks of experimentation, most of these questions were answered.

Questions and answers

Here is a list of the questions and the answers I found. It provides a quick summary of the previous twenty chapters. If you remember these answers, you will have all the knowledge required to take great insect shots.

Is insect photography hard?

No. I quickly found out insect photography is easy. With some minimal equipment and a bit of knowledge and skill you can create amazing images. Just try it. Start with the larger insects and slowly move on to the smaller ones. Initially keep your distance, but soon you learn how to approach insects and shoot them from close range. Insect photography is very rewarding and great fun. And it lets you spend lots of time outdoors in nature.

A Cinnamon Bug. 90 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

What camera do I need for insect photography?

You can use almost any camera you like. But to take the best shots, use a modern mirrorless camera with an APS-C sensor (Canon, Sony, Fujifilm, and Nikon) or Micro Four Thirds sensor (Olympus and Panasonic) to get extra magnification. You need a high resolution of at least 24 megapixels to allow for digital crop. Make sure the camera has fast autofocus.

What lens should I use?

Preferably use a macro lens with at least 1x1 magnification and a focal length between 65 and 100 mm. If you don't have one and do not want to buy one, use a normal prime or zoom lens with a focal length between 50 and 100 mm. Get some extension tubes to place between the lens and the camera to increase the magnification. Make sure they are automatic, that is, they pass on the electronic information to and from the lens, otherwise autofocus no longer works. You can also use a close-up lens, but extension tubes are easier. Best have a lens with fast autofocus and image stabilization. For butterflies and dragonflies, you might want to use a telephoto lens of 200 mm or more, to stay further away from the insects. Realize that a longer lens will have a smaller depth of field.

What is magnification, and why is it important?

A lens with 1 (or 1x1) maximum magnification can project an area of just 36 mm wide on a full-frame sensor. On an APS-C camera the smallest area becomes 24 mm wide. A lens with a smaller magnification, like 0.5, will show a larger area, while a lens with a larger magnification, like 2, will show a smaller area. The larger the magnification, the more detail you will see. The final effective magnification is determined by the lens, the sensor, and the amount of digital crop. With the 1.4 magnification lens I have, an APS-C sensor, and a two times digital crop, you get an effective magnification of 1.4 x 1.6 x 2.0 which is about 4.5. So, an insect of only 8 mm long will completely fill the image.

Do I need a flash?

Using a flash makes insect photography considerably easier. You don't have to worry about exposure and can concentrate more on getting the best composition. You can use a simple speedlight on top of the camera. Use a good diffuser around the lens to spread the light and avoid harsh shadows. Use TTL mode for the flash to let the camera determine the strength. A flash exposure compensation of +1 can be used to lighten up the insects a bit.

Do I need a tripod?

No. It is best to learn to shoot insects handheld. This gives you more flexibility to take the shots you want. You are more mobile, and you are always ready to take a picture. Even with a bit of wind and with moving insects you can still take the shots. Only in rare situations, like when shooting prepared insects indoors, or when using very high magnification, is a tripod or a monopod useful.

What exposure settings should I use?

When using a flash, use the fastest shutter speed that can synchronize with the flash. This is 1/320 of a second in my case. Use aperture F/13 and ISO 200. You can change the aperture when you want more or less of the insect in focus. Don't use auto ISO when using a flash! Without a flash, when the insect is in sunlight, you best use 1/125 of a second shutter speed, F/11, and ISO 100-400 depending on the amount of light. In the shade, use 1/125 sec., F/8, and ISO 400-1600. When not using a flash, it is best to set the ISO to automatic, to always have a good exposure.

A Scorpion Fly, taken with a flash. This species looks amazing and dangerous, but it is harmless. 125 mm + 31 mm tubes, 1/320 sec., F/16, ISO 200, flash.

Should I use manual focus or autofocus?

If your camera and lens allow it, use autofocus. Set the autofocus to continuous (called servo on Canon), disable subject tracking, and use the smallest spot focus area. In this way you can focus on the exact spot you want (typically the eyes) and let the autofocus compensate for camera motions. When using a narrow aperture, like F/13, focus will most of the time be successful, except when there is a lot of wind. When using manual focus, use the focus assist tools of your camera, like focus peaking and magnification.

How do I get the whole insect in focus?

Use a narrow aperture, like F/13 or even F/16. Try to put the whole insect in the same depth plane when taking a top-down or side shot. When shooting at an angle, always focus on the eyes. It does not matter that some parts of the insect are not in focus.

What is the best composition for an insect shot?

You need to lead the viewer to the important part of the image, which is often the head of the insect. Give the insect enough space in the direction it is looking in, try to place the head on 1/3 or 2/3 of the width or height of the image, choose a non-distracting background, and see whether there are lines that lead the viewer from the edge of the image to the head. While shooting, best leave some extra space around the insect, and do the final composition in post-processing.

How do I find insects to photograph?

There are insects everywhere. You do not have to travel far. Your backyard will already show plenty of variation. Don’t walk around too much. Stand still and investigate everything that looks unusual, like a dark spot on a flower or leaf. Also look lower to the ground. Some insects, like night moths,

only appear in the dark. With a white bed sheet and a strong lamp, you can attract and photograph them.

How do I find and photograph smaller insects?

Small insects are often hiding below leaves or deeper inside plants. Use the pizza box method described on page 106. Hold a box or tray under a plant and shake it. Insects will fall on the tray. Use a macro lens in combination with a close-up lens or extension tubes for extra magnification. Place the front bottom of the lens on the tray and slide it towards the insect until it is in focus. This gives the stability you need. Always be on the lookout for small insects. You can find them everywhere.

A very small moth, called a Bittersweet Smudge, about 8 mm in size. I found it in my kitchen and used my macro lens with a close-up lens to photograph it. 100 mm macro + Raynox DCR-250, 1/320 sec., F/16, ISO 200, flash.

What is focus stacking, and how do I use it?

For focus stacking you take several shots at different focus depths and then combine them into a single image, keeping the sharp parts of the images. It is used to extend the depth of field in your image to get a larger part of the insect in focus. Modern cameras can create a stack of images automatically. Some can even do the composition in the camera. For others you need to do this afterwards on the computer. When the camera can do all the work, this is a great technique that you are recommended to learn to use.

Do I need to post-process my insect shots?

Yes. Almost all insect shots benefit from some post-processing. The minimum to do is to use the JPG image produced by the camera and crop and rotate it for more magnification and to achieve the best composition. To improve the image further, use the RAW image instead and apply various image processing techniques, like improving tone and color, sharpening, adding dynamic contrast, and adding a vignette.

How do I identify the insects I am shooting?

You can use the websites or apps of iNaturalist[36] or observation.org[37] to upload your image and get the name of the insect. They also contain plenty of information about the different insects. You can maintain all your observations and you can see the observations of others. This can also help you determine where certain insects can be found.

Where can I shoot insects in winter?

There are still insects around in winter, but you must search for them, for example among leaves. Also, there are insects inside your house, garage, and garden sheds. You can visit a butterfly garden to shoot tropical butterflies, or you can collect or buy dead insects and photograph these indoors.

What should I do with my insect images?

There are many places where you can share your work. There are numerous Facebook groups on insects where you can place insect shots, or you can post your images at other social networks, like Instagram. If you want to take it a step further, create your own website, using tools like Squarespace[38] or Wix[39]. You can also join some local photography or nature groups.

I shot this German Wasp in the morning using focus stacking from 10 images. 100 mm macro, 1/125 sec., F/6.7, ISO 640.

Practice

Practice makes perfect, they say. My insect shots are still far from perfect. But if you look at the insect shots in this book, I think you will see some improvement (although the shots are not always in chronological order). I got much better at keeping the camera still, so the keep rate went up

[36] https://www.inaturalist.org/
[37] https://observation.org/
[38] https://www.squarespace.com/
[39] https://www.wix.com/

considerably, and the sharpness improved. I learned how to position the camera in more interesting ways, and I learned some special techniques, like focus stacking.

So, the best advice is to simply go out and photograph as many insects as you can. Try different positions and angles, use different settings, and make lots of mistakes. Don't be picky. Just shoot everything you see. Later, when you have more experience, you might start concentrating on a particular type of shots or some type of insects.

During my 20-week journey I took over 15,000 shots. Most of them were terrible, some were nice, and a few were excellent. Most shots I threw away. I only kept some 10% of my shots from which the 250 images in this book were selected. The others were not in focus, I used the wrong settings, or the insect and wind were not cooperating. Don't worry about that. It is the same for all photographers. If you go out shooting insects some afternoon and you end up with five good shots, you should be happy.

What is most important is to have fun. Finding insects that you have not seen before feels like receiving little presents. Managing to photograph them in an interesting way gives great satisfaction. And sometimes you happen to shoot these very special scenes, like the shot of the week on page 155 of an aphid giving birth. Or you find some rare insects, like the thread bug on page 142. But a simple fly can also be very nice when you photograph it from up close or in an interesting scene.

My journey was very satisfying and rewarding. I hope you will go through a similar journey with your insect photography.

Shades of yellow. A simple hoverfly can also make an interesting shot. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Other resources

Let me end my journey by pointing you to several other resources on the web. There is always more to learn.

There are many books on insects, but only a few books on insect photography, and most of them primarily show nice pictures. I cannot recommend any specific ones, although it is instructive to look

at the shots other photographers took. If you are interested in the insects themselves, make sure you get books that cover your country, as insects are different in different parts of the world.

There are many books on macro photography in general, and insect photography is a part of that. But insect photography is different from other forms of macro photography because you deal with subjects that you cannot manipulate easily, and that move around. Also, technology is changing fast, so books that are five years old are no longer up to date. Here are two books you might want to look at:

- *Mastering Macro Photography*, by David Taylor. This is a nice book with a lot of useful information. Most of this you already read here, but it is useful to get a different perspective on things. The book is from 2017 and, hence, at certain points a bit outdated. It still uses primarily DSLR cameras that have problems that modern mirrorless cameras have not, like focusing issues under low light conditions.
- *Digital Macro & Close-up Photography: New Edition*, by Ross Hoddinott. This is a rather old book, but it has been updated regularly. The book is similar in scope as the previous one, but with a bit less detail on photography technique. About one third of the book is about different types of objects you can photograph using macro techniques. This is nice if you want to broaden your scope, but not if you want to stick to insect photography.

There is a lot more information available on the web, especially on YouTube. Here are some channels I can recommend:

- I really like the channel of Micael Widell[40]. He is a Swedish macro photographer. His videos are very popular, with hundreds of thousands of views. He has some great introductory videos as well. I learned a lot from him.
- If you are interested in extreme macro, you should look at the channel of Allan Walls[41]. He has many videos on catching and preparing insects, on all sorts of equipment, and a lot more. You need some patience though. Many of his videos are long, sometimes over an hour.
- Steward Wood[42] also has nice videos on how he shoots insects.

And there are many more. Just search for insect photography. It is educational to see that all these photographers have their own styles. Don't be overwhelmed though. These are very experienced and often professional photographers that spend most of their time on photography. Don't expect that you can reach a similar level. Don't focus on the result only but enjoy the process to get better.

The end?

My 20-week journey is over. But this is not the end. In 2024, when insects appear again in abundance, I will continue photographing them. It is such a pleasure to be out in the fields and to find all these interesting creatures. And there is still so much more to learn. Here are some of the topics that I want to investigate further, and you might want to look at these as well.

[40] https://www.youtube.com/@MicaelWidell
[41] https://www.youtube.com/@AllanWallsPhotography
[42] https://www.youtube.com/@StewartWoodArt

A Common Striped Woodlouse. Not really an insect as it has way too many legs. These creatures can also be found in winter. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

- Up to now, most of my shots just show the insects in all their detail. You can call them insect portraits. But an insect lives in an environment. I want to try to pay more attention to the environment. This probably means taking shots from slightly further away. Also, it means using the flash less, such that you can see more of the background.
- Using a flash on the camera with a diffuser is a great way to start. But there are many other ways to work with light. You can of course use the ambient light. But you can also use different forms of continuous light. And you can put the flash in different places, for example to the side of the insect, or even behind it. This will either require a tripod, which I do not like, or learning to hold the camera with just one hand, such that I can use the other hand to hold the light or flash.
- Photographing insects in flight. This is very difficult as many insects flap their wings very fast and move in unpredictable patterns. But modern cameras have autofocus modes dealing with moving subjects and various burst modes that can help.
- Most of the insect shots I took so far were rather close to my house. But other parts of the Netherlands are home to other insects. For example, I want to look for insects in the dunes along the coast, or in the hilly areas in the south. With some preparation and research, you can find special species.

As always, I will report about my endeavors on my website www.insectphotography.org, in my articles on Medium[43], and later in an updated version of this book.

The journey is just beginning.

[43] https://medium.com/@m.h.overmars

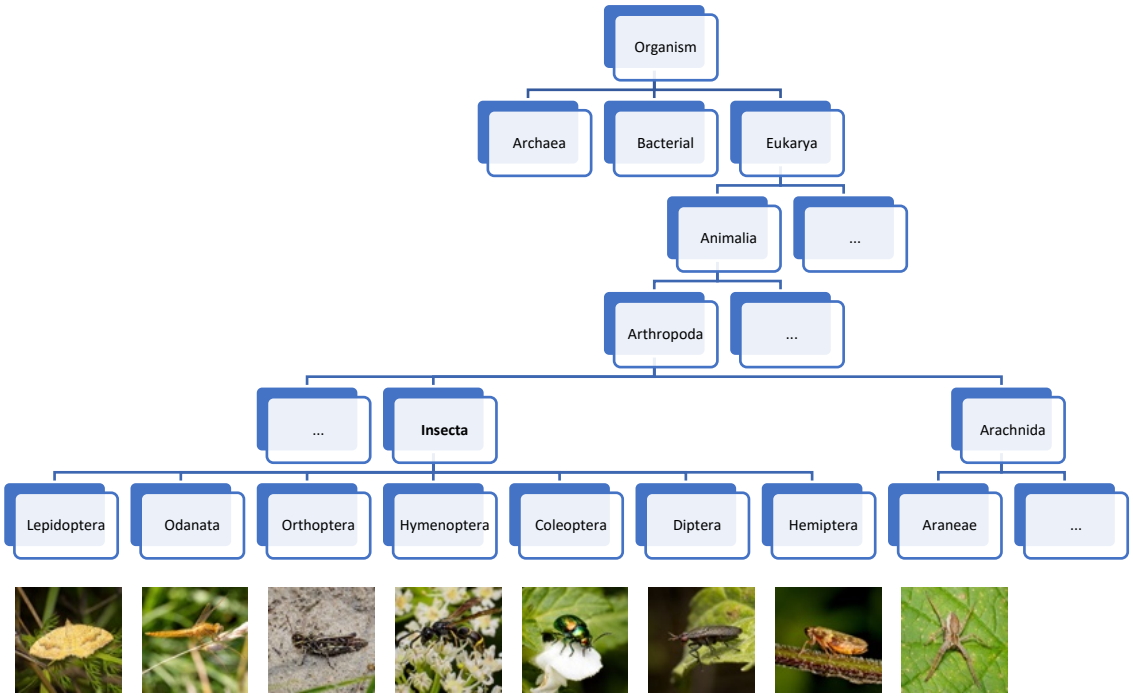
Insects

When you are photographing insects, it helps to know a bit about these creatures. In this second part of the book, I give a brief introduction into the fascinating world of insects. You will learn about the different insert orders, I will provide some interesting facts about the insects, and I will give some tips on how to photograph the different species. There is a lot more material about these insects on the web. For example, Wikipedia provides extensive information, and I will refer to the relevant pages.

Insect taxonomy

Biologists rank living organisms using a taxonomic hierarchy[44]. The highest level of this hierarchy consists of three domains, the Archaea (single cell organisms), Bacteria, and Eukarya. Each of these contains several kingdoms. Insects belong to the kingdom Animalia[45], which contains all animals, inside the domain Eukarya[46]. A kingdom is divided into phylums. Insects belong to the Arthropoda[47] phylum. In each phylum there are classes, and one of these is the class Insecta[48]. So, to get to our insects we have Eukarya → Animalia → Arthropoda → Insecta. This locates the insects in the hierarchy of organisms.

All insects have six legs. They belong to the subphylum Hexapoda[49] (which means six-legs in Greek). Spiders[50] do not belong to the insects because they have eight legs, but they do belong to the Arthropoda. Also, mites and springtails are not insects, although springtails have six legs.



The taxonomic hierarchy of the insects (simplified).

There are close to a million described species of insects. But biologists estimate that the actual number of insect species lies between 5 million and 30 million. There are over 10 quintillion

[44] https://en.wikipedia.org/wiki/Taxonomy_(biology)
[45] https://en.wikipedia.org/wiki/Animal
[46] https://en.wikipedia.org/wiki/Eukaryote
[47] https://en.wikipedia.org/wiki/Arthropod
[48] https://en.wikipedia.org/wiki/Insect
[49] https://en.wikipedia.org/wiki/Hexapoda
[50] https://en.wikipedia.org/wiki/Spider

(10,000,000,000,000,000,000) individual insects alive on Earth at any given time, according to the Entomological Society of America (ESA)[51]. Although individually small, the weight of all those insects together is estimated to be more than 250 times the weight of all humans.

Insect orders

These million insect species are divided into several orders, as is shown in the image above. Each order has several families, which are divided by genus, which then finally contain the various species. For example, the honeybee is the species Apis mellifera, which belongs to the genus Apis, the family Apidae, and the order Hymenoptera that consists of all the bees, wasps, and ants. The following major insect orders exist:

Butterflies and Moths (Lepidoptera[52]). Butterflies and moths belong to the same order. Over 180,000 species have been described. Some 17,500 of these are butterflies; the rest are moths. It is clearly one of the most popular orders of insects to photograph because of the beautiful colors and the size, although there are also very small butterflies. Most moths are active during the night but there are also moths that fly during the day, like this Yellow Shell.

Dragonflies (Odonata[53]). This is a rather small order with only some 6,300 species. This order also includes the smaller damselflies. You can distinguish them as follows. The dragonflies normally have their wings up or out at rest, while damselflies have their wings folded along their body at rest. Their larvae live in water, so you normally find dragonflies near water. They spend most of their time as underwater larvae. The adult stage is mainly meant for reproduction and is often limited to just a few weeks.

Grasshoppers and Crickets (Orthoptera[54]) This order has over 20,000 species. You can find them everywhere. They can jump and often fly. Many crickets make sounds by rubbing their wings against each other or against their legs. Locusts also belong to this order. They can form huge swarms that destroy every plant in their path. Such a swarm can contain a billion insects. Many crickets are used as food.

[51] https://entsoc.org/
[52] https://en.wikipedia.org/wiki/Lepidoptera
[53] https://en.wikipedia.org/wiki/Odonata
[54] https://en.wikipedia.org/wiki/Orthoptera

Bees, Wasps, and Ants (Hymenoptera[55]). When you think of bees or wasps you often just think of the well-known honeybee and the common wasp. But over 150,000 species of Hymenoptera have been described. Most of them are wasps. We all know the bees and wasps that live in large hives, but most species are solitary. Contrary to popular belief, almost all of them are completely harmless.

Beetles (Coleoptera[56]). This is the largest insect order with some 400,000 described species, and there are probably 3–5 times that many still undiscovered. Beetles come in many colors, shapes, and sizes. The largest insect in the Netherlands is a beetle that measures 9 cm. But there exist beetles in the world that are the size of your hand. Some are very colorful.

Flies (Diptera[57]). Some 125,000 species of flies have been described, but it is estimated that there must be over one million still undiscovered. Photographing flies is not very popular, but they can look beautiful at close range. Flies can have interesting patterns and colors. Some flies pretend to be bees or wasps for protection, but don't be fooled. Flies have two wings, while bees and wasps have four.

Bugs, Cicadas, and Aphids (Hemiptera[58]). This order has some 80,000 species. I really like photographing the shield bugs and plant bugs that are part of this order as these can have very nice colors and shapes, but the tiny leafhoppers are also beautiful.

In the following chapters I will discuss the different orders in more detail, giving some background information on the insects, showing some pictures, and providing some tips on how to best photograph them. I also include a chapter on spiders because these are popular subjects among insect photographers.

[55] https://en.wikipedia.org/wiki/Hymenoptera
[56] https://en.wikipedia.org/wiki/Beetle
[57] https://en.wikipedia.org/wiki/Fly
[58] https://en.wikipedia.org/wiki/Hemiptera

Butterflies (Lepidoptera)

The order of Lepidoptera[59] contains both the butterflies and the moths. Over 180,000 species have been described. Some 17,500 of these are butterflies; the rest are moths. In the Netherlands, where I live, there are only 53 species of butterflies, but over 2,000 species of moths.

Almost all butterflies are **diurnal**, meaning that they are active during the day and sleep at night. But there are a few species that are **nocturnal** and are active at night. For moths it is the other way around. Some 80% of the species are nocturnal. But there are still 30,000 species of moths that are active during the day. So, there are more day-active moth species than butterfly species.

The Purple-barred Yellow is a diurnal (day-active) moth. 90 mm, 1/320 sec., F/13, ISO 200, flash.

The easiest way to tell the difference between a butterfly and a moth is to look at the antennae. A moth's antenna is saw-edged or feathery, like in the image above. A butterfly's antenna has a long shaft and a club at the end, like in the image below. Another difference is that, when at rest, butterflies fold their wings vertically up above their backs. Moths on the other hand, hold their wings horizontally in a tent-like shape to hide their body.

Butterflies and moths come in all sizes. The smallest butterfly, the Western Pygmy Blue Butterfly, has a wingspan of just 13 millimeters, while the largest one, the Queen Alexandra's Birdwing, has a wingspan of 27 centimeters. The smallest moth in the world is much smaller. The Stigmella maya has

[59] https://en.wikipedia.org/wiki/Lepidoptera

a wingspan of just 3 millimeters, while the largest moth, the Hercules Moth, is much larger, with a wingspan of 35 centimeters.

Butterflies and moths drink nectar from flowers using a long tongue. Sometimes they also drink other sweet plant juices, but many butterflies and moths don't eat at all. They don't live long enough to need food. They use the energy collected while being a caterpillar to find a partner, mate, and lay eggs, after which they die.

Like all insects, butterflies are cold-blooded. They need to warm up their muscles to a temperature of some 25 degrees Celsius before they can fly. So, after a cold night you can easily approach them as they cannot fly away. That is, if you can find them, as they are normally carefully hidden.

Some butterflies can fly very fast. For example, the Southern Dart reaches a speed of close to 50 km per hour. Some can also fly large distances. There are moths that migrate from the south of Europe to the north and back. Monarch butterflies migrate from Canada to Mexico and back every year – the journey takes four generations to complete.

A Brimstone butterfly. The antennae end with a club and the wings are vertically above the body, so this is a butterfly and not a moth. 150 mm, 1/320 sec., F/13, ISO 200, flash.

Life cycle

The life cycle of a butterfly consists of four stages.

- **Egg**. Most butterflies lay their eggs on the host plants. Some place just one egg on each plant, while others put them all together. There are even butterflies that sprinkle their eggs above several host plants and the caterpillars must find the plants themselves. For most butterflies, the egg stage lasts a few weeks. But some butterflies overwinter as eggs.
- **Caterpillar**. When the egg hatches, a caterpillar appears. The caterpillars eat as much as they can. There are caterpillars in all sizes and colors. Some caterpillars live on top of the leaves or flowers while others, like the leaf miners[60], make corridors inside the leaves or stems.

[60] https://en.wikipedia.org/wiki/Leaf_miner

While caterpillars grow, they must shed their skin multiple times to accommodate their growth. Most butterflies stay in the caterpillar stage for 2-5 weeks, but some species overwinter as caterpillars and there are even caterpillars that live for three years before pupating.

- **Chrysalis**. When the caterpillar reaches full size, they form into a chrysalis, also called a pupa. These can be suspended from plants or trees or are hidden in the ground. For many butterflies and moths, the chrysalis is a cocoon of silk. Inside it the animal undergoes a complete transformation to become a butterfly with wings. This stage can last from a few weeks to a few months. Some species of butterflies even live for years as a chrysalis.
- **Adult**. The butterfly or moth emerges from the chrysalis with its wings folded about its body. They cannot fly yet, as the wings are soft. After a rest period, the butterfly pumps blood into its wings and then it can fly. Their goal now is reproduction. Because they can fly, they can find partners and they can spread their eggs over a larger area. Most adults live only one or two weeks, but some species overwinter as adults.

The chrysalis of a White butterfly. 100 mm macro, 1/320 sec., F/19, ISO 200, flash.

Photographing butterflies

Butterflies are probably the most popular insects to photograph. Most of them are reasonably large and they have beautiful colors and patterns. In week 15 on page 112 we extensively discussed photographing moths at night. So here I will only talk about butterflies and day-active moths.

To photograph a butterfly, you must get close to it. Some butterflies let you approach them relatively easily, but others fly away as soon as you get near. If you see an interesting butterfly flying around, don't start chasing after it. Simply stay put and follow the butterfly with your eyes. When it lands on a plant or flower, set the camera in the right mode, and make sure the flash is charged. First take a picture from a distance (probably without the flash). Then slowly try to get closer. When the butterfly flies away, repeat the process. This might take a while, but with some patience you often succeed.

It can help to use a long lens, for example a 200-400 mm telephoto zoom lens. That lets you stay further away. You do though need a lens with reasonable magnification. Some long lenses have a large minimum focus distance, and that won't work. Also, a diffused flash will not work at long distances, so you must use the ambient light that is present.

Many people take shots of butterflies that look like the image below. Butterflies can most easily be approached from behind and an image like this shows the complete wings with all its colors.

A Red Admiral butterfly, shot from behind. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Not all butterflies have their wings open though, and such top-down shots are a bit boring. When you take a shot from the side, you get a much better view of the eye, antennae, legs, and so on. Make sure the whole butterfly is in the same depth plane to have it completely in focus.

I think that the nicest shots are those where the butterfly has its wings partially open, and the shot is taken at an angle from the front. It adds more depth to the image and creates more of a connection with the butterfly, as the insect is looking in your direction. Care must be taken though to get the whole insect in focus. You will need a narrow aperture and the shorter the lens, the larger the depth of field. Best use a rather small magnification. You can always do some digital cropping afterwards.

A Small Copper with its wings partially open, taken at an angle from the front. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

If you want to take it a step further, you can also try to take a close-up shot. You must move very slow to be able to approach a butterfly this close though. But with some patience, it can be done.

A close-up of the head of a Comma butterfly. 80 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

Butterflies in flight

Photographing flying butterflies is very difficult. The insects fly in unpredictable patterns. This makes it almost impossible to keep them in the viewfinder, autofocus is unable to follow them, and manual focus is completely impossible. If you do manage to get a sharp picture, often the butterfly will have its wings in an unattractive position.

To give yourself a bit of a chance, use fast continuous shooting. Focus on a reasonable distance and use a narrow aperture to have a large depth of field. Stay a bit further away to have a larger area visible in the viewfinder and do some digital crop afterwards. And take lots and lots of shots.

You will need a fast shutter speed of at least 1/1000 of a second, otherwise you will get a lot of motion blur. Together with the narrow aperture this means that you will probably need a high ISO value and apply some noise reduction afterwards.

Some modern cameras, like my Canon R7, have a mode in which you can save photographs “in the past”, called RAW burst mode. This works as follows: While you press the shutter button half down, the camera continuously takes shots at 30 frames per second, using the electronic shutter. These shots are stored in the internal buffer, but not on the memory card. When you press the shutter button completely, the last half second of shots is stored on your memory card, together with the new shots for as long as you keep the button pressed. Other camera brands have similar functionality. On Panasonic it is called Pre-burst mode and on Olympus it is called Pro Capture. Sony does not seem to have this function.

You can apply this as follows. Point the camera to a butterfly that is sitting on a flower or leaf. Press the shutter button halfway and wait. When the butterfly takes off, fully press the shutter button, and hold it until the butterfly leaves the frame. There is a reasonable chance that one of the recorded shots is sharp and nice. The following image was shot that way.

A Red Admiral in flight. 50 mm, 1/1000 sec., F/7.1, ISO 2000. A considerable digital crop was required.

Photographing caterpillars

Even though they are the same species, finding and photographing caterpillars is completely different from photographing butterflies and moths. While adults can be found on many different plants with flowers (assuming they eat anything at all), caterpillars are very picky on the plant they live on. Most caterpillars have just one plant or plant family they can eat. This is called the **host plant**. If you want to find caterpillars of certain butterflies, you need to know the host plant. You

must also know the period of the year the caterpillars are there. This can be found on websites, like iNaturalist[61].

Caterpillar of a Chocolate-Tip moth. This is a natural posture where the caterpillar is eating the leaf. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Caterpillars have just one goal in life. They must eat as much as possible and collect a lot of energy that is used to transform themselves into an adult. As indicated before, some butterflies cannot even eat food, so all the energy they need during their short life must have been collected while they were a caterpillar. Most caterpillars eat leaves or stems while others eat flowers.

To find caterpillars, you must first locate the correct host plants. Now check whether part of the leaves is eaten, and whether those leaves have not yet been replaced by new, young leaves. This is a good sign that there might still be caterpillars on the plant. Carefully inspect the plant. Look at the bottom side of the leaves because that is where the caterpillars often sit. If you are lucky, you find some.

The caterpillars won't go away if you try to photograph them. So, you have all the time to take a nice shot. However, they are aware of your presence. When they notice you, they often lift the front part of their body. That can look nice for a photo, but it is not the natural posture.

[61] https://www.inaturalist.org/

Caterpillar of a Polar Kitten. Because it senses danger, it has lifted its head. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Not every insect that looks like a caterpillar is a caterpillar. The larvae of other insects might be mistaken for caterpillars. They can still be very beautiful and are worth photographing.

This is not a caterpillar, but the beautiful larvae of a Sawfly, which is not a fly but a wasp. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Some more examples

Here are some more shots I took of different butterflies and day-active moths.

Three butterflies: a Peacock, a Brown Argus, and a Queen of Spain Fritillary. Three moths: a Latticed Heath, a *Nettle-tap, and a Yellow Shell. Two caterpillars: a Peppered Moth, and an Iron Prominent.*

Dragonflies (Odonata)

The Odonata[62] form a small insect order, with only some 6,300 species worldwide. It consists of the larger dragonflies and the smaller damselflies. Of these, only 71 species have been seen in the Netherlands. They come in many sizes and colors. Nannophya pygmaea is the smallest known dragonfly, mostly found in Southeast Asia, with a wingspan of just 20 millimeters. The largest dragonfly is the helicopter damselfly Megaloprepus coerulatus, with a wingspan of 19 centimeters.

Dragonflies feed on smaller insects. You often see them flying around in weird patterns to catch the insects in the sky. They have excellent eyes for this. The best of all insects. Dragonflies are often found near water, as their larvae live in water. The larvae are also carnivorous and eat other organisms and small fish.

Dragonflies start as eggs that are laid in water or on vegetation near the water. They take one to five weeks to hatch, producing larvae. Dragonflies spend most of their time underwater as larvae. They live between one and three years in this stage. Afterwards, they move out of the water, metamorphose to breathe air instead of water, and slowly push out of their old shell bodies to emerge as young adults. There is no pupa stage. Initially they are still pale. It takes about a week for them to get their final colors. They sometimes venture away from the water and can also be found in dry areas. But after a while they return to mate and lay eggs. They live only between 2 and 8 weeks as adults, depending on the species.

A Broad Scarlet. This is a dragonfly. 400 mm, 1/500 sec., F/11, ISO 640.

[62] https://en.wikipedia.org/wiki/Odonata

The order Odonata contains both the damselflies and the true dragonflies. You can distinguish between them as follows:

- When resting, dragonflies spread their wings out. Damselflies fold their wings along their body or hold them up.
- Dragonflies have big eyes that almost touch near the top of their head. Damselflies have smaller eyes, in the form of half spheres, one on each side of the head.

Dragonflies are often also larger than damselflies and have a more robust body.

A Common Bluetail. Initially they are not blue but green. This is a damselfly. 70 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

Dragonflies are good flyers. Some can fly faster than 50 km per hour. The fastest flying insect is a dragonfly. Dragonflies can also fly backwards, although not very fast. And they can fly sideways and up or down. They can change their direction of flight very suddenly. This is necessary for them to catch flying insects. But it makes photographing them in flight extremely difficult. They can also hover in the air or glide, without moving their wings. When hovering they are a lot easier to photograph.

Dragonflies can fly long distances. The longest recorded distance is 18,000 kilometers. That is more than any other insect.

A hovering Ruddy Darter, shot from above. By using a flash, the wings are frozen. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

You can regularly see dragonflies or damselflies mating, sometimes forming a heart-like shape, like in the image below. This is a rather common sight. The duration can be a couple of hours, depending on the species. For some species, after the mating, they stay connected while the female finds a spot for the eggs. For other species, the male flies around to fight off predators.

Two mating Common Bluet damselflies, forming the typical heart shape. 400 mm, 1/500 sec., F/11, ISO 640.

Mating dragonflies are easy to photograph. They tend to move less, although they can fly while being connected. Make sure that both insects are in the same depth plane. Otherwise, just one of them will be in focus.

Photographing dragonflies

Dragonflies and damselflies make beautiful subjects for photography. They have an elegant shape, fine structure, prominent eyes, often transparent wings, and amazing colors.

Damselflies can easily be approached when they are resting. Because these are rather large insects you do not need a macro lens. Any lens will do. But if you want to photograph details, like their eyes, you need a long macro lens to be able to keep a bit of a distance. Approach them very slowly and there is a good chance they will not fly away.

For dragonflies, this is a different story. Some dragonflies fly for very long uninterrupted periods. Others are very alert and will fly away when you get near to them. For example, take the Black-tailed Skimmer in the image below. These are the largest dragonflies in the Netherlands. They are very common, but very hard to photograph. The males often sit on the warm ground near water, looking for females. Already when you are still a couple of meters away, they fly up. To shoot them you need a long lens, like a 400 mm telephoto lens, and be very slow and patient.

A Black-tailed Skimmer, sitting in the sun on a bike lane near a pond. Using a 400 mm telephoto lens I could photograph it from 5 meters distance. 400 mm, 1/320 sec., F/8, ISO 100, large crop.

Other dragonflies are easier to shoot. Some species, like the darters, sit on high spots where they have a good view over the surroundings, for example, on poles that stick out of the ground. These dragonflies can be approached more easily, making it possible to take very detailed shots. You can also try to find dragonflies early in the morning after a cold night. They must warm up before they can fly. This makes it easier to photograph them.

When you want to photograph a complete dragonfly from a close range, it will be difficult to get the whole insect in focus. It is long and the wings stretch out wide, which requires a large depth of field. In such a situation you can use focus stacking. The dragonflies normally sit very still. And you do not

need a large magnification. So, this is an ideal situation for focus stacking. You just need a couple of images to cover the entire focus depth.

Some more examples

Three dragonflies: a Four-spotted Chaser, a Moustached Darter, and a close-up of a Common Darter. Four damselflies: a Small Redeye, a Common Winter Damsel, an Azure Bluet, and a Western Willow Spreadwing.

Grasshoppers and Crickets (Orthoptera)

The insect order Orthoptera[63] consists of more than 20,000 species worldwide, of which only 64 can be found in my country. It comprises grasshoppers, locusts, and crickets. For ease of presentation, I will call them all grasshoppers from now on. When you walk in nature you often see grasshoppers jumping away. There are lots of them, but that does not mean they are easy to photograph in interesting ways.

Most grasshoppers live on or close to the ground, where they also lay their eggs. Young nymphs resemble the adults, but they lack wings. They go through successive molts, each time growing and developing their wings, until, after the final molt, they emerge with fully developed wings and can fly. The speed of growth is widely variable and may take a few weeks to some months depending on food availability and weather conditions.

The color of a grasshopper can vary a lot, even in the same species. Color changes can happen after each molt, and it might be different for different surroundings the insect is living in. Here are two images of a Blue-winged Grasshopper. It is hard to imagine this is the same species.

Two Blue-winged Grasshoppers. The colors can vary a lot. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Female grasshoppers have an ovipositor[64] with which they can make holes in the ground and in plants, and through which they then place an egg in the hole. The image below shows the difference between a male Long-winged Cone-head that does not have an ovipositor, and a female that uses it to make holes in the stem.

[63] https://en.wikipedia.org/wiki/Orthoptera
[64] https://en.wikipedia.org/wiki/Ovipositor

A male (left) and female (right) Long-winged Cone-head. The female has an ovipositor to make holes for laying eggs. Here she is making holes in a stem. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Locusts can become agricultural pests. They form huge swarms that destroy every plant in their path. Such a swarm can contain over a billion insects. On the other hand, locusts and grasshoppers have been used as food throughout history. They are seen as meat and are considered a delicacy in many countries.

Photographing grasshoppers

You can find grasshoppers everywhere, both in wet and in dry areas. But because they are well camouflaged, you often only see them when they jump away. And at that moment they are alert and aware of your presence and it is almost impossible to photograph them.

So, you better see them before they see you. Then approach them very slowly. They might stay where they are, although they often turn to the other side of the stem or blade of grass, and they tend to turn their back to you, such that they can easily jump away.

A head-on shot of a Large Marsh Grasshopper. Most grasshoppers won't let you take such a shot. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

You need to get low, on your knees, to photograph grasshoppers, as that is where they normally can be found. Otherwise, you will only get top-down shots. Side shots often look nicer. And if you are lucky you might manage to get a head-on shot. Some grasshoppers have very long antennae. It is not always necessary to have them completely in the picture. But, as always, keep enough room in front of the head and focus on the eyes.

Because you find grasshoppers often between the grass or between lots of branches, it is hard to separate them from the background. And, as the background is close by, it won't be very blurred and will create a lot of distraction. You can try to correct that though in post-processing.

Some more examples

A Great Green Bush-cricket, Field Grasshopper, Woodland Grasshopper, Mottled Grasshopper, Common Ground-hopper, and a Bow-winged Grasshopper.

Bees, Wasps, and Ants (Hymenoptera)

The Hymenoptera[65] order consists of the bees, wasps, and ants. When you think of bees or wasps you often only think of the well-known honeybee and the common wasp. But worldwide over 150,000 species of Hymenoptera have been described. Most of them are wasps. Insects in this order have four wings (if they have wings at all).

The common honeybee and wasp live in large hives, but most species of bees and wasps are solitary. Females typically have an ovipositor with which they can insert eggs in plants or larvae of other insects. For species that no longer need the ovipositor to insert eggs, like those living in hives, this ovipositor is often transformed into a stinger.

A parasitic wasp (Stenarella domator) with a very long ovipositor. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Even though some of these insects have a stinger, most of them are completely harmless. When photographing bees and wasps you can often get very close without any risk. I never got stung while shooting them. But you must always be careful, especially when you might be allergic to stings.

[65] https://en.wikipedia.org/wiki/Hymenoptera

Bees

There are over 20,000 species of bees[66] described. But almost all the bees you see are honeybees because they are raised specifically for honey production. Because of this commercial use, other species of bees sometimes have trouble finding enough food to survive. Studies show that the number of wild bee species is declining rapidly due to human impact.

Bees feed on nectar and pollen. They eat the nectar themselves, but most pollen is used as food for their larvae. Bees play an important role in pollination of plants. The second most prominent application of commercial beekeeping. Bees transfer the pollen from flower to flower. Often you see this as yellow patches on their legs, like in the image below.

A bee covered in pollen. Note the large yellow patch of pollen attached to the leg. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Bees can often be approached easily when they eat nectar from a flower. They don't pay much attention to you most of the time. They tend to move around a lot though, flying from flower to flower. So, you must be quick to get a good shot. Make sure all settings in your camera are correct and the flash is charged before you approach them. A shot from the front is often difficult to obtain. A problem with photographing bees, and especially with bumblebees, is that they have lots of dark hairs. There is little dynamic contrast in the insect which leads to poor images. You often need some post-processing to get that dynamic contrast back.

[66] https://en.wikipedia.org/wiki/Bee

A Buff-tailed Bumblebee, with lots of dark hairs. 110 mm + 31 mm tubes, 1/180 sec., F/13, ISO 200, flash.

Wasps

When taking about wasps, most people think about the lemonade wasps. These are the ones that bother you at the end of the summer while you are eating outside, because their natural food has run out. The lemonade wasps consist primarily of two different species of wasps: the Common Wasp and the German Wasp. Some people are very afraid of them, but I have photographed many of these wasps, even from very close range, and never had any trouble.

Hornets are large wasps. They eat nectar but catch other insects to feed their young. Watching hornets hunt down other insects is an amazing sight. I saw a large European Hornet flying around between the flowers. Then it suddenly threw itself on a fly, right in front of my eyes. The fly stood no chance. I could see the hornet carefully dissect the fly. Within a minute there was nothing left of it, except a little package for the young, which he then took away. Here is one of the shots I took.

A European Hornet that caught a fly and is preparing it to feed it to the young. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

There are over 100,000 other species of wasps described, and many more that have not been described yet. Some are very small, like the Encyrtid wasps that I photographed when using the pizza box method described on page 106. These are smaller than 5 mm in size.

Some of the most beautiful wasps, at least in the Netherlands, are the Cuckoo Wasps, with their bright colors.

A colorful Cuckoo Wasp. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Wasps are relatively easy to photograph, except for the very small ones. They can easily be approached and sometimes they sit still for quite a while.

Ants

It might be surprising that ants belong to the same order as bees and wasps, but many ant species have wings at some point during their life cycle, although it might be just for one day. In summer with the right hot and humid conditions, the new queens and winged males take to the sky, such that the queens can mate with males from different colonies and set up new nests. After mating the queens look for a place to start a new nest, then chew off their wings. Their flying days are gone.

A large ant queen with wings. 70 mm + 31 mm tubes, 1/180 sec., F/13, ISO 200, flash.

Some ants farm aphids. Aphids feed on the sap from the plants they live on. They secrete honeydew, which the ants like to eat. So, the ants protect the aphids, and the plants they are on from predators and in return, they can collect the honeydew. They even “milk” the aphids. By stroking the aphids with their antennae, the aphids are stimulated to secrete the honeydew.

An ant with its herd of aphids. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Photographing ants is difficult. They are small – at least the ones in the Netherlands – and they constantly move around. This means you must predict where they are going, focus there, and wait. Sometimes, ants follow the same trail. In this case you can focus on the trail to find a composition you like. Also, ants are often crawling around in larger groups, making it difficult to single one out. A group shot can be nice, but you will never be able to get them all in focus.

Many ants are crawling around, making it hard to separate one and get a sharp shot of it. 400 mm, 1/500 sec., F/8, ISO 2000.

Some more examples

Bees: Sphecodes albilabris, Banded Mud Bee, Sharp-tail Bee (rare in the Netherlands), Yellow-Loosestrife Bee. Wasps: Carrot Wasp, Field Digger Wasp, Gambrus carnifex, Turnip Sawfly.

Beetles (Coleoptera)

Order Coleoptera[67], commonly known as the beetles, is the largest insect order with some 400,000 described species. There are probably 3–5 times that many, but most have not been described yet. In the Netherlands around 4,000 of these have been observed. Still, when you look around, you see few of them, except for the omnipresent ladybugs. The reason is that many beetles live on or in the ground, are small, only appear at night, and/or are very well camouflaged. But if you look carefully, you can find many species.

An Orange Ladybird. When ladybugs sit still, they retract their head. But when they walk around you can see their head and eyes. That is the better way to photograph them. 70 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

Beetles are both a blessing and a curse. Over 300 species of beetles are used as food, mostly as larvae. For example, the well-known Mealworms are the larvae of the Yellow Mealworm Beetle. They are bred commercially as food for birds and for humans. Many insect-based foods contain Mealworms. However, beetles can also become agricultural pests. Still other beetles, like the ladybugs and dung beetles, are beneficial and help to control pests.

Beetles come in all sizes. The largest known beetle species grows to 16 centimeters, while the smallest is less than 0.5 millimeters in size. The largest insect in the Netherlands is the Stag Beetle that measures 9 centimeters.

[67] https://en.wikipedia.org/wiki/Beetle

For beetles, the front pair of wings have hardened into covers that protect the rear pair of wings. These covers can be very colorful, which makes these beetles a beloved object of collection. There is even the ancient craft technique called beetlewing art[68]. There are beetle farms all over the world, that produce such decorative beetles or beetle wings.

Photographing beetles

Most beetles don't move very fast and are not easily scared away. They can fly, but normally don't. So, you can approach them with ease to photograph them. They do though tend to turn their back on you or move to the other side of a stem or leaf. It can help to hold the leaf they are sitting on with your left hand and turn it in the desired orientation.

A problem with photographing beetles is that many of them are very shiny. They reflect a lot of light which can result in burnt-out areas. This is especially the case when you are photographing in bright sunlight or when using a flash. A good diffuser will reduce the effect. You can also improve this in post-processing by reducing the highlights. But if there is no color information at all in the image, there is little that can be done. Slightly underexposing the shot can help.

When photographing a largely black beetle, like this Spring Dor Beetle, shininess will help to provide depth and contrast. Post-processing was required to bring back some details. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

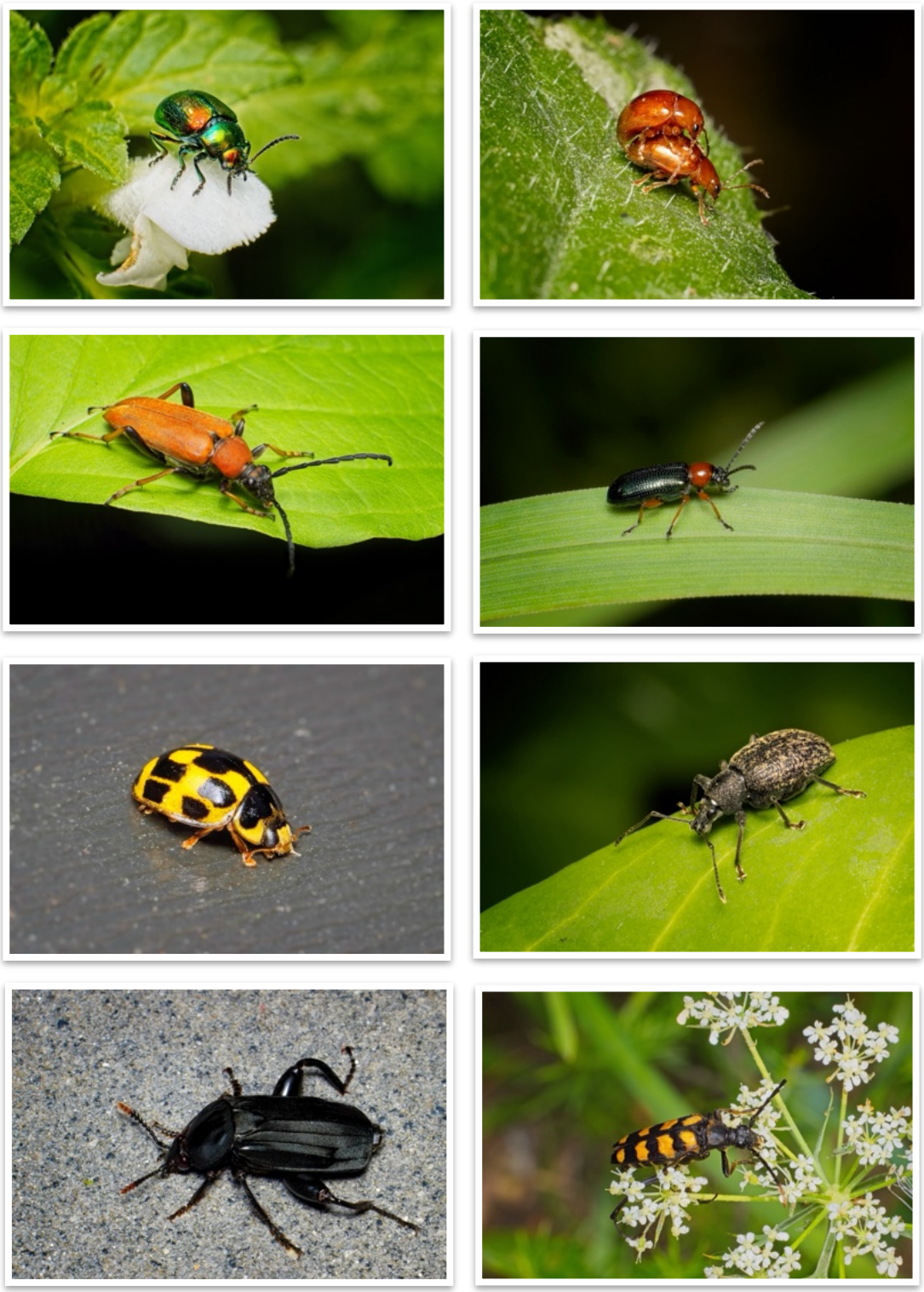
When photographing largely black beetles, it is difficult to get enough dynamic contrast in the image. In this case the shininess can help. It adds some depth to the image. In such a situation, a slight overexposure is beneficial. You can improve the dynamic contrast in post-processing, assuming there is still some tonal information in the black areas.

Some beetles are long, while other are round. As a result, for almost any direction from which you take a shot, there is a considerable distance between the nearest point and the furthest point on the insect. This makes it hard to focus. You need a narrow aperture. As always, make sure the eyes are in focus. Talking about eyes, they are sometimes hard to see because they are close to the bottom of

[68] https://en.wikipedia.org/wiki/Beetlewing

the head, or they are black in a black head. Always try to make them visible. It sometimes helps to lighten them up slightly in post-processing.

Some more examples



Dead-Nettle Leaf Beetle, mating Artichoke Beetles, Red-brown Longhorn Beetle, Oulema, 14-spot Ladybird, Black Vine Weevil, Necrodes, and another species of Longhorn Beetle.

Flies (Diptera)

The insect order of the flies is called Diptera[69]. Some 125,000 species have been described, but it is estimated that there must be over one million. In the Netherlands some 5,000 species have been registered. Flies, mosquitos, and midges belong to the order Diptera.

Flies have two wings, contrary to many other insects that have four. They normally have only short antennae. There is a huge variety in flies. Some feed on nectar from flowers, other feed on rotting organic material, while others feed on (human) blood.

Flies have a short life cycle. Eggs often hatch within a week. Within three weeks the larvae have grown and form a puparium. Normally, within a few days the fly emerges. Most adult flies live between two and four weeks. They lay eggs, and the cycle starts again.

Flies come in many different sizes and shapes. Most flies are not particularly large, although the largest fly in the world, the Gauromydas heros, can reach a length of 7 centimeters and a wingspan of 10 centimeters. The smallest known fly is just 0.4 millimeters in size.

Most flies look rather boring, although they can have large and nicely colored facetted eyes. This is the reason extreme macro photographers like to photograph flies from very close range. But there are also brightly colored flies, particularly those that pretend to be wasps.

A Thick-headed Fly of the species Leopoldius brevirostris. This fly mimics a wasp. It is rare in the Netherlands. 85 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

[69] https://en.wikipedia.org/wiki/Fly

A Hornet Mimic Hoverfly. 150 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

Some of these mimicking flies take it a step further. The Hornet Mimic Hoverfly is, as its name indicates, a fly that mimics a hornet. It is a large hovering fly. They lay their eggs in nests of wasps and hornets. The female fly simply walks into the nest. She is not attacked by the wasps. It is not exactly known why, but probably she produces pheromones that make the wasps docile. When the eggs hatch, the larvae live at the bottom of the nest and feed on waste from the nest.

Photographing flies

Photographing flies is not very popular, but some of them look very beautiful, for example, those that mimic wasps and bees. Also, very small flies can look nice when you see them in detail. For example, fruit flies can have interesting eyes, wing patterns, and colors. But you need a good macro lens to photograph them.

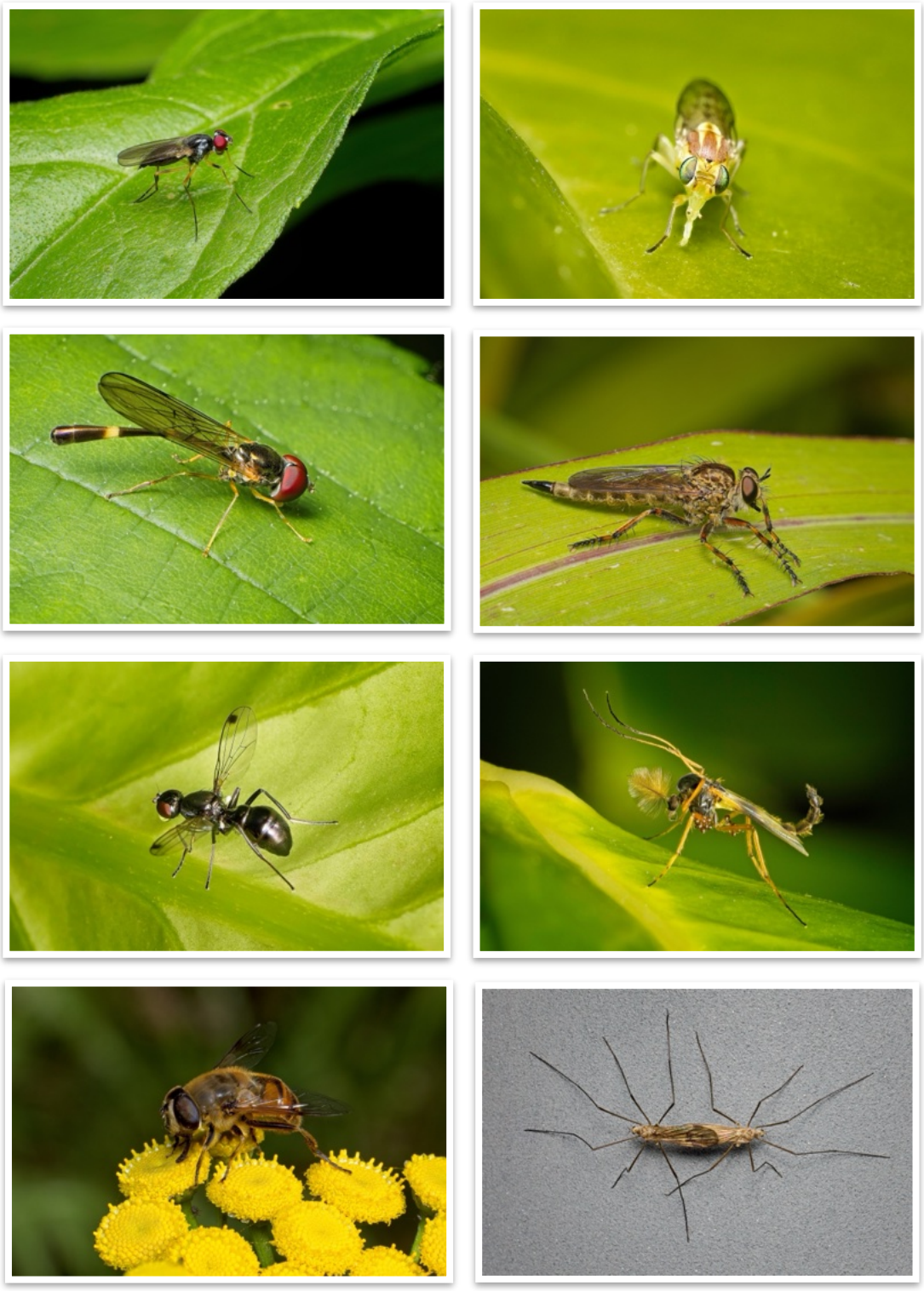
It is a real challenge to shoot a fly while flying. You have the best chance with hover flies, as these flies regularly hover at a spot. But most of the time they move on before you manage to get them in focus. You either need a very fast shutter speed or use a flash to freeze the action. But even then, there is normally movement left in the wings. This can give a feeling of action though, so it does not need to be a problem.

One hoverfly (a Stripe-faced Drone Fly) hovering above another one. Probably a male attracted by a female. These flies mimic bees. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

A nice category of shots is those of mating flies, and mating insects in general. They are popular on Facebook groups. The insects often perform delicate balancing acts, like in the image below. It is surprising that they still can fly, either together, or with one dangling below the other.

Two mating Fungus Gnats. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Some more examples



A rare Stretched-foot Fly, Grass Fly, Common Dainty, Brown Heath Robberfly, Sepsis, Midge, Common Drone Fly, and two mating Crane Flies.

Bugs, Cicadas, and Aphids (Hemiptera)

The order of Hemiptera[70] is one of the smaller insect orders and has "only" some 80,000 species, of which some 1,500 have been observed in the Netherlands. The most common suborders are:

- the Heteroptera[71], including shield bugs, plant bugs and flower bugs,
- the Auchenorrhyncha[72], including cicadas, leafhoppers, planthoppers, froghoppers, and treehoppers (but not the grasshoppers), and
- the Sternorrhyncha[73], which includes the aphids.

The name **bug** is officially reserved for the insects in this order, but many other insects also have the word bug in their name. Hence, people often talk about **true bugs**. Sometimes they restrict this name to the Heteroptera suborder, as these look the most like what we would consider a bug.

An Ant Damselbug. Under his head you can clearly see the mouthpiece for piercing and sucking. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

[70] https://en.wikipedia.org/wiki/Hemiptera
[71] https://en.wikipedia.org/wiki/Heteroptera
[72] https://en.wikipedia.org/wiki/Auchenorrhyncha
[73] https://en.wikipedia.org/wiki/Sternorrhyncha

These insects come in all sizes, ranging from 1 millimeter to over 10 centimeters. The Hemiptera have sucking and piercing mouthparts. Most of them suck plant sap, but some suck blood, like the nasty bed bugs.

Some of these insects, particularly many aphids, are agricultural pests. Because of their colors, others have been used to extract dye. And some, especially cicadas, have been used as food.

Photographing bugs

I really like photographing bugs. You see examples of them throughout this book. The Heteroptera are often beautifully colored. They can be found on leaves or flowers, so you can easily spot them. Most of them can fly but they prefer not to. Hence, they can easily be approached. They might turn away from you or disappear under a leaf, so always approach them slowly. Make sure your camera is ready to shoot, and the flash is charged, before moving closer.

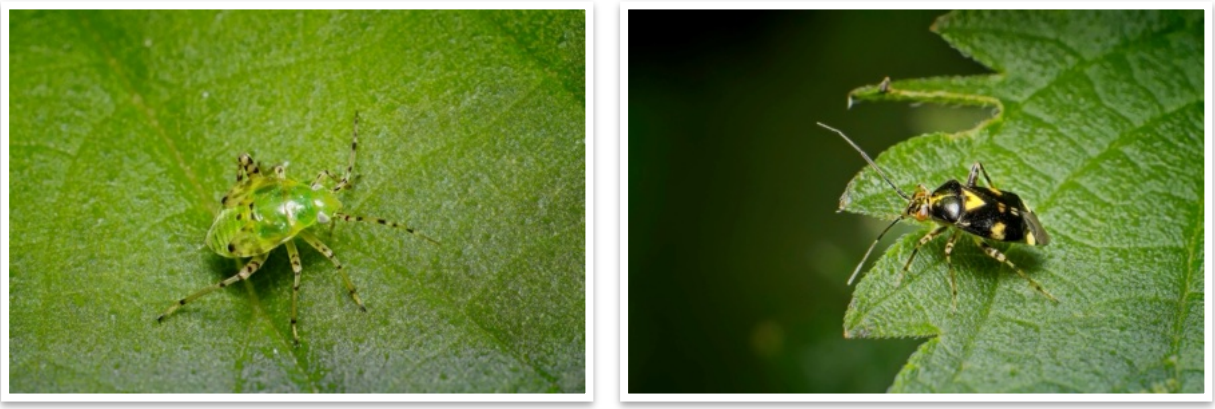
Many of these bugs have a reasonable size of more than 1 centimeter, and don't require a large magnification, although there are also very small species. The only problem with photographing them is that they often are rather wide and have long antennae and legs. This makes it hard to get them completely in focus.

Top-down shots can work for these bugs. Because of the colors and patterns on their back, they look very nice. Preferably though, take the shot slightly from the front and not from the back. Make sure you can see their eyes.

A top-down shot of a Firebug in a flower. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Side shots or shots at an angle are more interesting. They are especially nice when the insect is standing on its legs with its body raised, like the Ant Damselbug above. Sometimes they sit on a small leaf or near the rim, which makes it possible to shoot them against a distant blurred background. For such shots you need to get on your knees though. You can also try a shot from the front only showing the head. Their heads look very interesting. Some have only two eyes while others have two or three additional point eyes, called ocelli. Make sure the long antennae do not cover the eyes.

Bugs can change considerably in shape and color when they grow up. A nymph (young) will not yet have fully developed wings and can have completely different colors than an imago (adult).



A Common Nettle Bug. In the image at the left, you see a nymph with very small wings. In the image at the right, an imago with a completely different color pattern. 80 mm + 31 mm tubes, 1/320 sec., F/16, ISO 200, flash.

Photographing cicadas

Cicadas are considerably harder to photograph. Most of them are small, so you need to get close. And you sometimes need a close-up lens for extra magnification. When you approach the cicadas, they often jump away. So, you must act fast. That combination, acting fast using a large magnification, often leads to shots that are out of focus.

Two mating Ligurian Leafhoppers. 100 mm macro + close-up lens, 1/320 sec., F/13, ISO 200, flash.

It is also hard to find them. They often hide in the grass or sit under leaves or on stems. When you walk through the grass or touch the plants you often see them jump away. But once they are active, it becomes almost impossible to photograph them. So better spot them, before they spot you.

One way that works reasonably well is the pizza box method, described in week 14 on page 106. By shaking some bushes or large pieces of grass, the cicadas fall in the tray. They seem to be stunned

for a while, giving you some opportunity to photograph them. By rotating the tray, you can shoot them from a nice angle. But you need to hurry. Soon they get back to their senses and jump away.

Some more examples

A Striped Shield Bug, Common Nettle Flower Bug, Common Stilt Bug, Mottled Shield Bug, Bishop's Mitre Shield Bug, Meadow Froghopper, Green Leafhopper, and a Diplocolenus abdominalis.

Spiders (Araneae)

Spiders are not insects. They have eight legs while all insects have six legs. They also do not have antennae. Spiders form a separate order in the Arthropoda, called the Araneae[74]. Most spiders can inject venom and they can extrude silk to create webs and other structures. More than 50,000 species of spiders have been described, of which close to 600 have been observed in my country.

Many people are afraid of spiders, though most of them are harmless. There are a few species whose venom is dangerous to humans, so, when you are photographing spiders from close range, you better know which spiders are dangerous. Fortunately, in the Netherlands where I live, there are no dangerous spiders.

Spiders come in all sizes. The largest spider is the Goliath Birdeater from the Tarantula family, with a body length of 13 centimeters. The smallest spider has a leg span of less than half a millimeter.

The eyes are one of the striking features of many spiders. Most spiders have eight eyes, although there are also species with six, four, or even just two eyes. The quality of the eyes varies between species. The jumping spiders have the best vision. They have very big eyes to achieve this. They need this excellent vision to be able to jump on their prey from a distance. Still, they can only see sharp up to a few centimeters. Other spiders rely less on visual information.

A jumping spider (Marpissa muscosa) with its big eyes. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

[74] https://en.wikipedia.org/wiki/Spider

Spiders can produce silk. Many spiders use this to build webs. Different spider species create differently shaped webs. Expert can distinguish between spiders just by looking at the webs. Not all spiders build webs. Some spiders weave a little carpet of silk on a leaf. When an insect lands on it or walks over the carpet, it gets stuck, and its movement alerts the spider that is waiting nearby. Jumping spiders don't build webs at all, but they use silk as a safety rope when they jump on prey, such that they won't fall. Silk is also used to package eggs and for building nests. The young of some species use a long silk rope as a balloon. They are light enough that the wind can carry the silk rope with the spider to other places. In this way they can travel long distances.

Photographing spiders

Some spiders can be approached easily, while others quickly run away when you get near them. Always move slowly and make sure you see the spider before it senses you. But even when they run away, they often do so in bursts. They take a quick run and then pause for a while. This gives you the opportunity to get a good shot.

When spiders are feeding on some prey or are packaging it in silk for later use, they can normally be approached more easily. This can make nice shots. Be careful though that it is still clear what is the spider and what is the prey. Sometimes there are just too many legs sticking out in different directions. It helps when the spider has a distinctive color, like the green spider below.

A Green Cribellate Spider of a few millimeters in size, eating a little fly. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Because spiders have long legs, it is hard to get them completely in focus. And sometimes it is even impossible to get the complete legs in the image. That does not need to be problem. The legs can be out of focus, and they do not need to be completely visible. Concentrate on the important part of the spider, like the head, or the colorful back.

The web of a spider can be beautiful when it is nicely shaped, but it can also be distracting. When you are using a flash, the white web can become too prominent in the image. You can try to make it less visible in post-processing by reducing the highlights in the part of the image containing the web,

but it is often unavoidable that it remains visible. It would also look weird when the spider was floating in the midair.

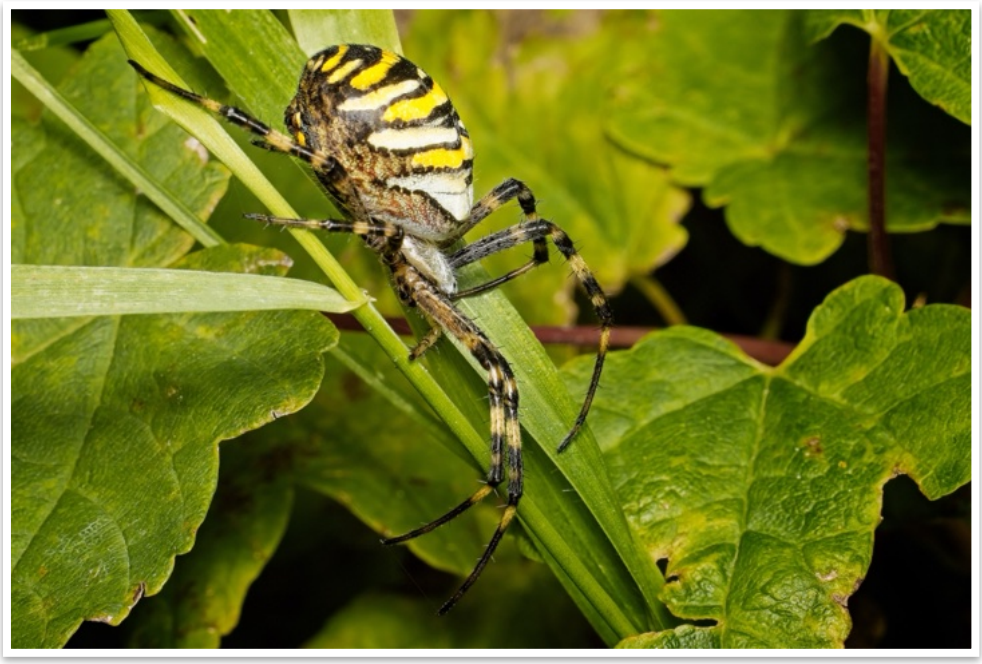
A Garden Cross Spider. The web of this spider is rather ugly, distracting the viewer from the beautiful pattern on the back. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Many spiders only come out at night. You will need a flashlight to find them. This can give great photo opportunities, using a flash. However, with such shots, the web can become way too prominent. Sometimes you can photograph the spider along one of its web ropes, avoiding showing most of the web.

A Bridge Orbweaver at night. 130 mm, 1/320 sec., F/13, ISO 400, flash.

Because the eyes of spiders are so special, it is important to try to take the shot such that the eyes are visible, and to get them in focus. This is often difficult because for many spiders the eyes are close to the bottom of their head, and they are often hidden from view. Also, the legs move above them and often block the view of the eyes.

You need to get to the same level of the head of the spider to photograph them. This is especially difficult when the spider is sitting on its web. For example, if you look at the image of a Wasp Spider below, you cannot really see the eyes because they are covered by the front legs. But the nice striped back makes up for this. These spiders build their webs close to the ground because they catch grasshoppers, so you must kneel to photograph them.



A Wasp Spider. Until recently these were rare in the Netherlands, but their numbers are rapidly increasing. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Some more examples

A Crab Spider, Zebra Spider, Four-spotted Orbweaver, Sac Spider, Common House Spider, an ant-like jumping spider (Synageles venator), and another jumping spider (Ballus chalybeius) with prey.

Other insects and Arthropods

There are several other insect orders that are smaller than the major ones described in the previous chapters, in addition to several other Arthropods that are neither insects nor spiders. You can encounter any of these while photographing insects, and many make great subjects. Here I describe some of the orders you might find.

Scorpion flies

The head of a scorpion fly. 90 mm + 31 mm tubes, 1/320 sec., F/13, ISO 200, flash.

Scorpion flies are not flies but form their own order, called Panorpidae[75]. It contains close to 500 species, of which just five can be found in the Netherlands. They have an amazing head, as the image above shows. For the males, their tail curves up, like a scorpion, hence the name.

These insects are very photogenic, reasonably large, and they can easily be approached so they make great subjects, if you can find them. If you want both the head and tail in focus, best take a side shot. However, the wings stick out to the sides, so they might not be sharp, but that is often not an issue. A top-down shot shows the triangular wings, but you lose the nice head and curled tail.

Net-winged insects

The order Neuroptera[76] of net-winged insects, has over 6,000 species. It includes the lacewings, the dustywings, and some other families. Their four wings can have very delicate patterns. You best take

[75] https://en.wikipedia.org/wiki/Panorpidae
[76] https://en.wikipedia.org/wiki/Neuroptera

a side shot to make sure that the whole insect is in focus, including both the head and the full wings. The shot below shows a green lacewing. Look at the color of the eye. In Dutch it is called the goldy eye. The translucent wings show an intricate pattern.

A lacewing (Chrysoperla carnea). 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Caddisflies

A caddisfly (Limnephilus lunatus). 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

The order Trichoptera[77] consist of some 15,000 species. They look a bit like moths, but their larvae live in water, rather than on land. You often find these when you are trying to attract night moths using a light. Fortunately, the identification apps can easily make the distinction.

Because of the way these insects hold their wings, a side shot normally works best. That is the only way to get it completely sharp (except for the long antennae). However, a closeup shot from the front can also be interesting.

Lice

The order Psocodea[78], formerly known as Psocoptera[79], consist of different types of lice. There are over 10,000 species in this order, many of which are very small. They are hard to identify. As a result, there is also quite a bit of uncertainty about how common or rare certain species are. For example, the louse in the image below is considered very rare in the Netherlands, but common in the south of Europe. It is moving north, probably due to climate change, like many other insects.

Photographing lice is difficult because they are hard to find. All lice I photographed so far, I found using the pizza box method, described on page 106. But even if you find them, it is still hard to get a good shot, because they are small, and they tend to run around a lot. You need a good macro lens and sometimes extra magnification, using a close-up lens or extension tubes. But that reduces the depth of field considerably. So, focusing is not easy. But if you try long enough, you will succeed. In the image below you can see the very narrow depth of field in the piece of wood containing the louse.

A louse (Peripsocus milleri) that is considered very rare in the Netherlands, although the number of sightings is increasing. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

[77] https://en.wikipedia.org/wiki/Caddisfly
[78] https://en.wikipedia.org/wiki/Psocodea
[79] https://en.wikipedia.org/wiki/Psocoptera

Cockroaches

The order Blattodae[80] contains both the cockroaches and the termites. There are some 4,000 species of cockroach, most of them in the tropics. They come in many different sizes, shapes, and colors. They are very ancient and originated over 300 million years ago. Some are rather large. The largest species measures some 9 centimeters. Many people dislike them but just a few species can be considered as pests. Other species are eaten in many places in the world.

Photographing cockroaches is a lot like photographing bugs. They can fly, but tend not to, so they can be approached rather easily. I prefer a shot at an angle from the front, such that you can see the eyes and you can see part of their back patterns, like in the image below.

A Tawny cockroach. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Harvestmen

The animals in the order of harvestmen, called Opiliones[81], look a lot like spiders, but they are a different order. There are close to 10,000 species in this order. They are not insects as they have eight legs, like the spiders, but they have only two eyes, while most spiders have six or eight.

Most harvestmen have very long legs. They can use them as a defense mechanism. If a predator holds a leg, they can let the leg go, to escape. So, you regularly see animals with less than eight legs.

The long legs make it very hard to photograph them in full. And if you could, it will be impossible to get them completely in focus. But fortunately, that is not necessary. By showing just part of the legs, the viewer easily fills in the missing parts. In this way you can concentrate on the body and the always so important eyes, which are located on top of the body. When taking a top-down shot, the legs sticking out in the different directions give an interesting effect, bringing the viewer automatically to the center of the image. But you can also take a head on shot and have the legs

[80] https://en.wikipedia.org/wiki/Blattodea
[81] https://en.wikipedia.org/wiki/Opiliones

disappearing to the sides. However, because the eyes are a bit backwards, you need a narrow aperture to get both the eyes and the front of the head in focus.

A harvestman (Opilio canestrinii) with a missing leg. 100 mm macro, 1/320 sec., F/13, ISO 200, flash.

Millipedes and centipedes

Millipedes and centipedes belong to the order Myriapods[82]. They clearly have more than 6 legs, but they have much fewer legs than the name suggests. However, recently a millipede was discovered that has indeed more than 1,000 legs. The order contains around 13,000 species. They come in many colors and many sizes. There are species of more than 30 centimeters in length.

When you try to photograph them, it is important that you show the legs, because that is what they are famous for. This works best with a side shot. Because they are long and are often winding, it is difficult to get the whole animal in focus. In that case, you might want to take a close-up shot of part of the animal, preferably including the head.

[82] https://en.wikipedia.org/wiki/Myriapoda

Half a millipede (Cylindroiulus caeruleocinctus) showing lots of legs, shot at night. 100 mm macro, 1/250 sec., F/13, ISO 200, flash.

Woodlice

The woodlice belong to the order Isopoda[83], that contains over 10,000 species. About half of those live in water. While lice are insects, woodlice are not. They have more than six legs, which is a clear indication they are not insects. In the Netherlands, you can find them all year around, so they make good subjects for photography during the winter. They come in many different color variations, even within the same species.

Most of them are rather large and they don't move fast, so they are easy to photograph. However, when they are disturbed, they sometimes roll up in a ball, which makes them less attractive to shoot.

Often you find these animals on the ground between dead leaves and other dirt, which does not make for a nice shot. But sometimes you are lucky. In the image below a woodlouse was sitting on a green leaf, giving a nice contrast with its brownish colors. With the chosen angle you see all the legs nicely spread out. The woodlouse is rather large. As a result, it is impossible to get it completely in focus, even using F/16.

[83] https://en.wikipedia.org/wiki/Isopoda

A Common Striped Woodlouse. 75 mm, 1/250 sec., F/16, ISO 200, flash.

The previous chapters, together with this one, demonstrate that there is an amazing variation among insects and related small creatures. You find insects with all sorts of shapes, sizes, and colors. Different species can be found at different locations and at different times of the year. They behave in diverse ways and require various approaches when trying to photograph them. There is always something new to discover, which makes insect photography a fascinating hobby.



Insect photography is easy and fun. Taking great shots of insects is something everybody can do. With some basic equipment, some rudimentary knowledge of photography, and some simple skills, also you can take stunning insect shots within weeks.

This book is proof of that. The author is an amateur photographer who started off with hardly any knowledge of insect photography. The book describes his 20-week journey from a beginner to an acclaimed insect photographer. It teaches you how to make a similar journey.

In this book you find everything you need to know about the camera and lenses, exposure settings, using a flash, and how to get sharp images. It shows you how to post-process your images to improve the quality, and it treats special techniques, like focus stacking.

But the book also teaches you about insects, where and how to find them, and how to photograph them in the best possible way. It contains over 250 images of insects, shot by the author.

Join the fun and fascinating world of insect photography.