



# Infrared Night Camera Instructions

Please note that this is a DIY camera, not a commercial product. We have done our best to make the instructions easy to follow, but there are some fiddly steps and it may take some experimentation and tinkering to make things work.



<https://mynaturewatch.net/make/>



# Before building your camera please read and agree to our guide for good practice

## WHEN PLACING THE CAMERA KIT

- Consider your own personal safety when placing the camera. Do not do anything you don't feel comfortable and safe doing. Work with a buddy to help each other out, if you like. Working at height and / or over water is discouraged.
- Consider other people's privacy when placing the camera. Connect to the Naturewatch camera to see what it sees and appropriately frame the image.
- Consider where's best to place the Naturewatch camera. We advise deploying the camera on your own property, such as your garden or land that is owned or managed by you. Make sure to secure the Naturewatch Camera appropriately (weighing 200grams maximum).

## WORKING ALONGSIDE WILDLIFE

- Do not touch / handle animals under any circumstances.
- Do not disturb nests, setts or any other animal homes.
- Keep noise and disturbances to a minimum.
- Do not disturb or destroy plants, eggs, animals or geological features.
- Check on your kit periodically for any defects.
- Take any litter home.

# The Parts

The parts you need to make the camera can be ordered from online retailers or bought in electronic hardware stores. You may need to **shop around to find the best deal for each part** Prices can vary considerably, but it should be possible to source a complete kit for around £40.

**Note: the standard infrared camera requires no soldering!**



## CAMERA PARTS

- Raspberry Pi Zero W
- Infrared camera module for Raspberry Pi Zero\*
- USB Power bank/battery (ideally over 12000mAh in capacity)\*\*
- USB charger for charging the power bank
- 16GB (or greater) Micro SD card\*\*\*
- Micro USB cable
- A self-adhesive heatsink
- Waterproof container such as a takeaway food box

## USEFUL TOOLS AND ACCESSORIES

- Computer with WIFI access
- Smartphone or tablet (optional)
- Micro SD card adaptor or external micro SD card reader
- Cardboard
- Masking tape
- Sticky pads
- Hot glue gun / Sugru / sealant
- Silica gel pouches
- Bait
- Scissors
- Drill
- Soup or sauce container as lens shield
- Camouflage tape (optional)

\* There many different versions of infrared camera modules for Raspberry Pi on sale, be sure to get one with a cable compatible with Raspberry Pi Zero W

\*\* The cost of power banks vary enormously, so do shop around. In addition, the capacity of the battery depends on how long you wish to leave your camera running. Some users are happy with 2 or 3 hours of usage from a pound-shop battery, while others prefer that the battery lasts over a day – so finding the right balance may take some experimentation.

\*\*\* Please Note: Some retailers supply SD cards in bundles the have an operating system called NOOBS preinstalled. This is not the right software for the cameras, and will be deleted automatically when you install the My Naturewatch Camera software on them (steps 1 –5 below).

# Overview

## There are 6 stages to making a My Naturewatch Camera.

- I. **Download the Software.** The camera software needs to be installed on the SD card. The Raspberry Pi Zero will read the software from the SD card and run the My Naturewatch Camera.
- II. **Assemble the Electronics.** Here you will attach the camera to the Pi Zero.
- III. **Name Your Camera.** You can use the default name or change it and give your camera its own name and password.
- IV. **Test Your Camera.** Now you can power up the camera and see if it works.
- V. **Make the Camera Housing.** Assuming you have a working camera, it's time to make a weather-resistant housing from household materials.
- VI. **Assemble the Camera.** Finally, you're ready to fix the camera inside the housing and try it out!

The whole process should only take 60 - 90 minutes.

# I. Download the Software

Copy the camera software to a micro SD card (up to 1 hour). This software contains the operating system for the Pi Zero and an application that controls the camera. This bundled software is often referred to as a 'disk image'.

Downloading the software and installing it on the SD card can take a while, depending on things like the speed of your internet and the computer you're using. You can skip to step 6 and continue working through the '**Assembly**' and '**Housing**' sections while you wait for actions in steps 1-5 to complete if you like.

1. Download the disk image (a 4.5 GB file) from the following link (up to 1hour download depending on the speed of your connection):  
<http://interaction.gold.ac.uk/naturewatch-cam-v0p4p2.img>
2. Take note of the location where the disk image is being saved on your computer.
3. Download an application called '**Etcher**'. (<https://www.balena.io/etcher/>) This will copy the disk image to the micro SD card safely and easily (note: Etcher refers to the process of copying the disk image as 'flashing the drive').
4. Insert the Micro SD card into your computer - using a micro SD adaptor\* (your laptop may have a built-in SD card reader), or an external micro SD reader

5. Using '**Etcher**' software - select the disk image as '**Image**' and the micro SD card as '**Drive**', then press '**Flash**'. This step takes around 15 minutes.

**Helpful Tip:** the time can be shortened by deselecting "**Validate write on success**" in the Etchers settings menu, found by clicking the cog on the top right of the app.

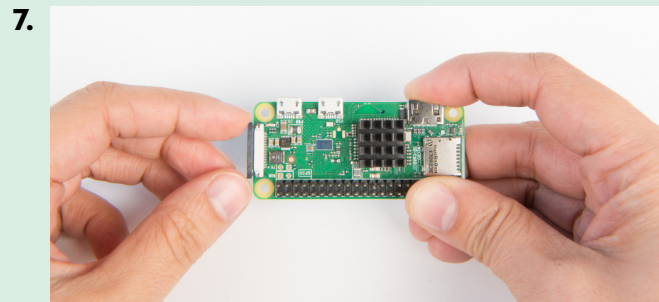
**Note:** After Etcher has '**flashed the drive**', Windowsbased computers will sometimes ask if you would like to format the SD card. If this happens, click '**no**', otherwise the software will be deleted.

\* When using a micro SD adaptor, be sure that the copy protection switch is unlocked (<https://itstillworks.com/copy-protect-sd-card-6114311.html>).

# II. Assemble the Electronics

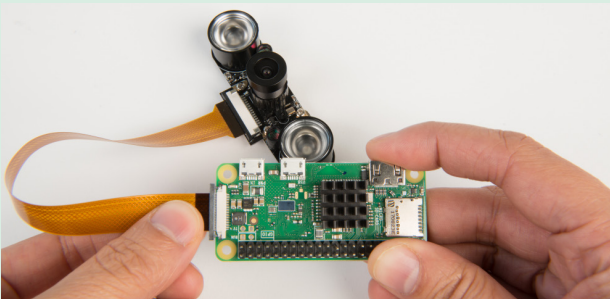
\* (This shape is optimised for use with the Sistema Kip It 900ml cracker box. In this version, the camera and Pi Zero are mounted on opposite sides of the card.)

6. Make sure your USB Power Bank is fully charged by plugging it into the mains via its cable and plug. Most batteries have LED lights to indicate level of charge



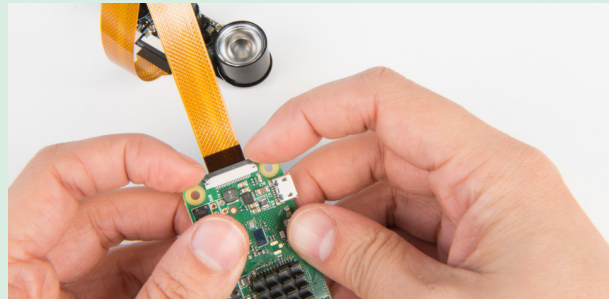
*The camera connector is very fragile, so take care on this step!*

To attach the camera module to the Pi Zero: unclip the black locking strip away on the white camera connector on the Pi Zero - it should move outwards by 1mm and feel loose.



Now insert the camera module ribbon under the black strip and into the white

connector - the metal side of the camera ribbon should face toward the green board.



Secure the ribbon by re-clipping the black strip towards the white connector.

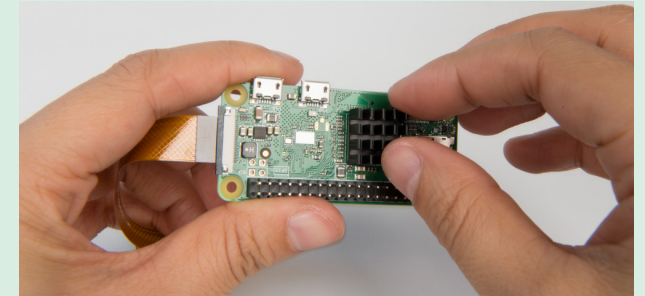
*If the connector breaks, you can hold still use hot glue or tape (not superglue) to hold the cable in place - but its best to be gentle and patient to avoid breakage.*

8. In order to dissipate heat from the processor it is necessary to attach a



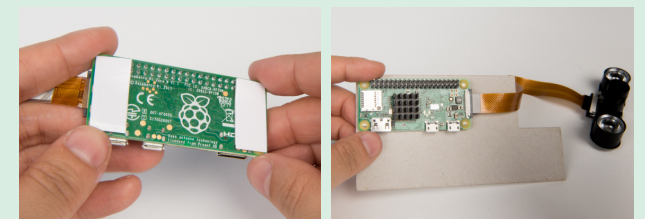
heatsink.

Raspberry Pi heatsinks generally have self-adhesive tape already applied. Peel away the protective layer of the tape and



carefully stick the heatsink squarely over the large black chip on the Pi Zero.

9. Use a stiff piece of card appropriate in size to the container you plan to house the camera.



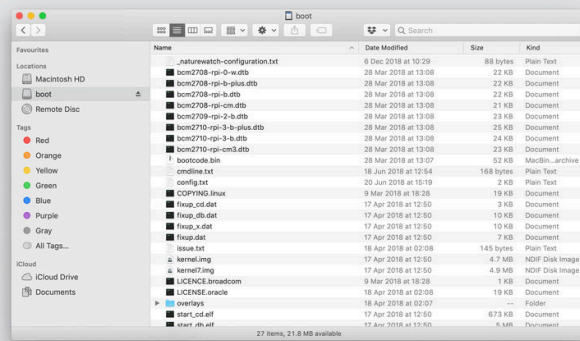
You can download a printable outline drawing of the card\* here: <https://tinyurl.com/cardshape>. Use double-sided sticky pads to mount the Raspberry Pi to the card, here we have mounted it offset to the centre to allow space for the USB power lead.

**Tip:** If you plan to use a large container, the Raspberry Pi and camera can all be mounted to one side of a piece of card.

# III. Rename Your Camera

The My Naturewatch Camera creates it's own wireless network allowing you to control it through a web browser on any smart phone, tablet or computer connected to it. Here you can change the name of this wireless network or if you are happy with a default name of 'MyNaturewatch' skip to step 13 .

10.



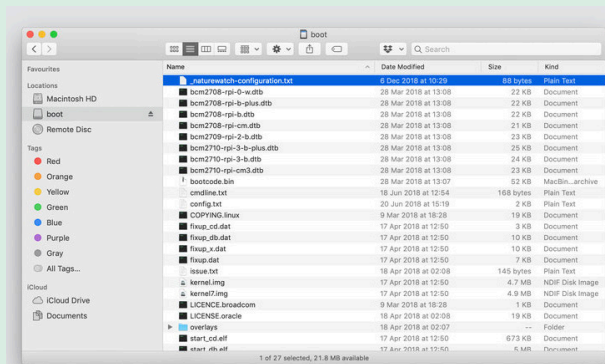
View the contents of the micro SD Card on your computer by selecting 'boot'.

11. In 'boot', open:

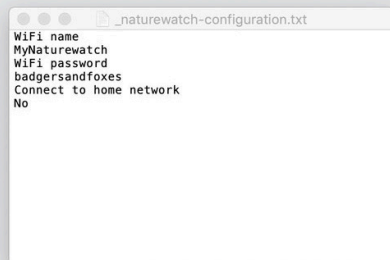
'\_naturewatch-configuration.txt'.

**Tip:** You may need to eject the Micro SD Card and reinsert it again before you can

view the contents



12. The name and password of your Camera can be edited by rewriting the appropriate lines which are by default 'MyNaturewatch' and 'badgersandfoxes'



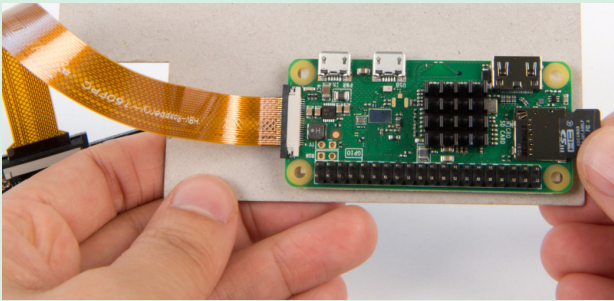
respectively. There is no requirement

to change the default names, but the option is available to provide choice or for situations where there is an intention to run multiple cameras simultaneously. Please note that any new name password must contain at least eight characters of letters or numbers. Be sure to save the file if you make changes.

**Note:** 'Connect to home network' is for a future feature.

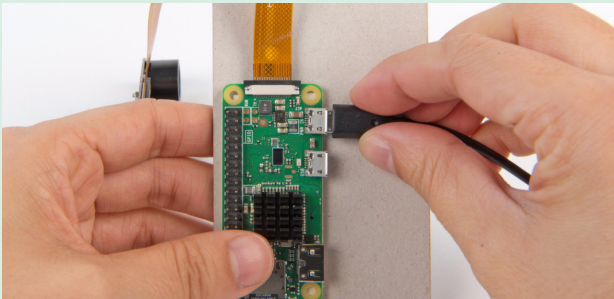
# IV. Test Your Camera

13.



Insert the micro SD card into the silver socket on the Pi Zero – the metal contacts on the SD Card should face toward the green board.

14.



Power the assembled unit by connecting the USB power bank to the Pi Zero. The small end of the USB cable plugs into the 'PWR' port on the end of the Pi Zero closest to the camera. The large end of USB cable plugs into the USB battery (or

any USB power source).

15. Allow 60 seconds for the Pi Zero to boot up. The green light on the Pi Zero will flicker to indicate processing. Once the system has started, a red LED on the camera ribbon cable will light. If the red LED does not light, it is likely that the camera ribbon cable is not correctly seated in the Pi Zero and so repeat step 7.
16. On a smartphone, tablet or computer connect to the camera's wireless network. The wifi network name will either be 'MyNaturewatch' or the unique name you gave it in step 12. The wifi password will either be 'badgersandfoxes' or the unique name you gave it in step 12.
17. Once connected with your device, open any internet browser and visit the following webpage to access the camera interface:

**<http://camera.local>**

You should see the live preview feed from your camera along with the following simple control buttons: **Start Image Capture, Image Gallery and Settings.**

**Tip:** if your browser rejects the URL try entering the My Naturewatch Camera IP address instead: **192.168.50.10**

Find more information about the web interface in 'Using My Naturewatch Camera': **<https://mynaturewatch.net/using>**



# V. Make the Camera Housing

As with the daylight camera, the infrared camera will need to be protected from the elements by some sort of housing. The possibilities are endless, from ziplock bags to more elaborate constructions. We show you one possibility here using takeaway food and soup containers, but feel free to improvise. We also have a blog post that demonstrates how to separate the infrared lamps from the camera lens to produce cinematic lighting effects.

18.



The camera works best if the lens is not behind the housing material, no matter how clear that may seem. We drill a hole in the main housing and use a rain cover to protect the lens.

Carefully cut around the bottom of a

supermarket soup container or similar to make the camera lens / infrared lamps cover (always take care cutting plastic).

19.



We have found that the easiest way to mount the infrared camera is to make three holes adjacent to one another that allow the camera lens and the two infrared lamps to pass part-way through. In this example, we have made the holes using a 20mm forstner drill bit in the lid of a takeaway food container, though you could also use a small drill, scissors or scalpel to achieve a similar result (always take care cutting plastic).

20. Position the cover you made earlier over the lid of a takeaway food container

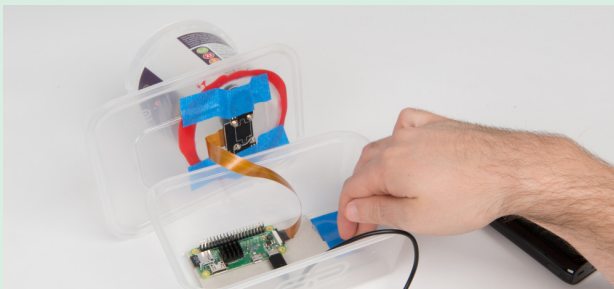
and make a waterproof seal using a hot glue gun, Sugru (<https://sugru.com/>) or household sealant.



# VI. Assemble the Camera

Instructions on how to set your camera up continue on the next pages or online:  
<https://mynaturewatch.net/using>

21.



Pass the infrared camera unit through the holes that you made in the lid of the takeaway container. Secure with masking tape or similar, along with the cardboard

Pi Zero mount inside the takeaway container. Add a silica gel pouch and connect the battery, place the lid/cover assembly over the container. Warp with



camouflage tape (which is and reusable and can be repositioned).

22.



Done!  
Your camera is ready to be used!

# Using Your Camera

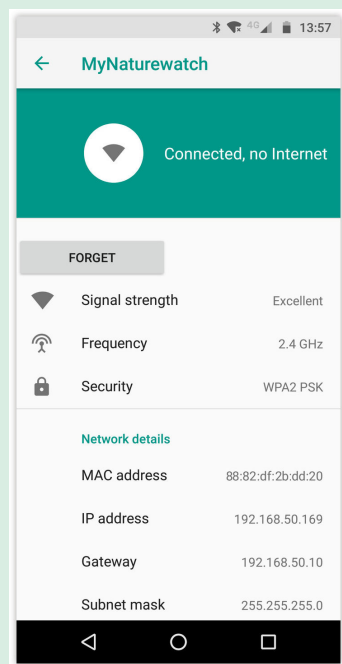
Using My Naturewatch Camera is straightforward:

1. Power up the camera by plugging the power cable from the camera to a charged USB battery / powerbank.
2. Enclose the camera in the case you've made.
3. Position the camera in a good place to spot wildlife, trying to avoid busy backgrounds.
4. Scatter bait about 0.5 - 1 meter from the camera for optimal focus.
5. Use the web interface to control the camera and see pictures.



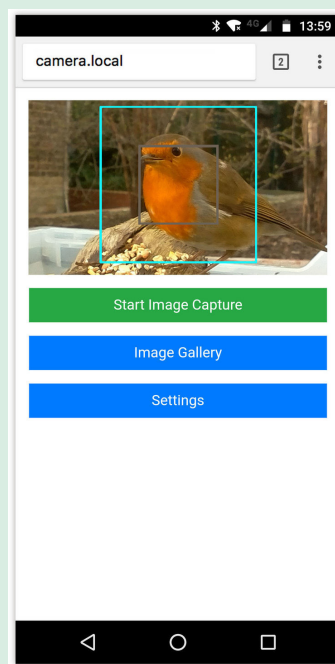
## Using the Web Interface

1.



Using wi-fi settings on your device, search for the wi-fi network name created by your My Naturewatch Camera. It will have the default name of 'MyNaturewatch' with the default password of 'badgersandfoxes' or it will have the name and password you entered in the configuration file when building your camera.

2.



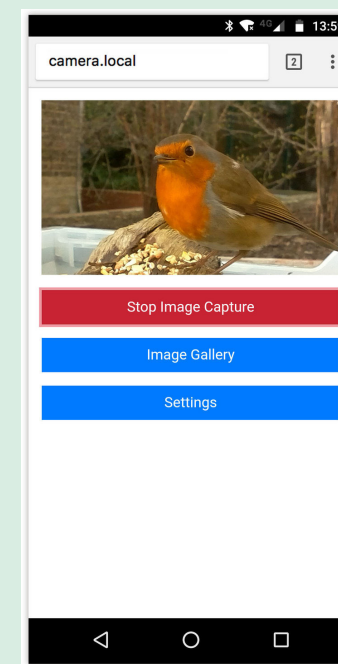
In your web browser, type out the following address:  
**camera.local**

You should see the live preview feed from your camera along with the following simple control buttons: **Start Image Capture**, **Image Gallery** and **Settings**.

**Note:** some browsers insist on the full http address, which is **http://camera.local**

**Tip:** if your browser rejects the URL try entering the My Naturewatch Camera IP address instead:  
**192.168.50.10**

3.

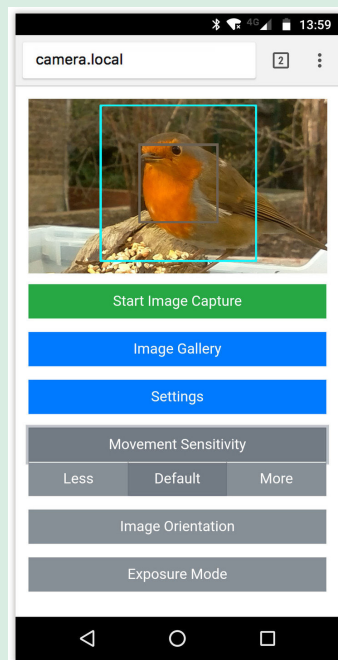


The My Naturewatch Camera takes photos by continuously monitoring the live preview feed for movement. When you want to begin this process, press '**Start Image Capture**' button. The camera will now taking pictures automatically and the button will change to a red '**Stop Image Capture**' button. All the recorded images will be stored within the **Image Gallery**. Press the '**Stop Image Capture**' button to cease capture.

The live preview feed in the browser window is useful to setup your camera and frame the area you want to monitor for wildlife, but it is not intended for continuous use. Once the My Naturewatch Camera has been setup and the image capture begun, disconnect by closing the web browser window, whether on phone, tablet or computer. Keeping the live preview feed open in the browser will drain the battery and put extra strain on the Raspberry Pi which could lead to overheating issues.

## Using the Web Interface

4.



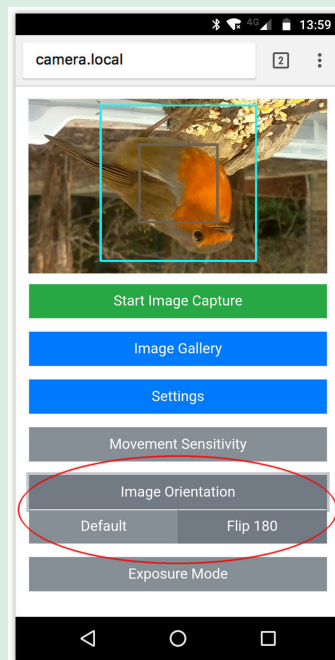
The My Naturewatch camera takes photos by looking for a significant change in what it can see. The square outlines on the preview image above represent the size of change the camera looks for to determine whether or not to take a photo. The sensitivity of the camera can be altered to prevent false positives – unwanted pictures taken when there is no wildlife in the camera frame.

The small grey square symbolises the smallest change and the bigger cyan square the largest. In the default setting shown above, the grey square is about 15% the size of the overall image, meaning the camera will take an photo each time the camera sees at least 15% change across the whole image.

To adjust sensitivity, click **Settings > Movement Sensitivity**. Selecting '**More**' will decrease the size of the grey square so that the camera looks for very small changes, however this could increase the number of false positives if there is background motion (such as rustling leaves). Selecting '**Less**', will increase the size of the grey square but could lead to wildlife being missed.

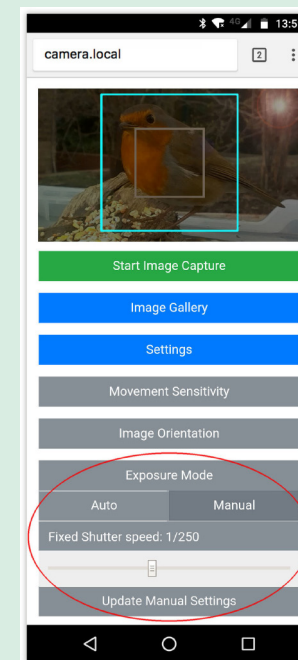
Altering the sensitivity of the camera is a trial and error process, but a good tip for setting up your camera is to try and position it so that the background has as little movement (trees, bushes, cars, people) as possible.

5.



Depending on how you built your My Naturewatch Camera, the live preview feed may appear upside down. To correct this, click **Settings > Image Orientation > Flip 180**.

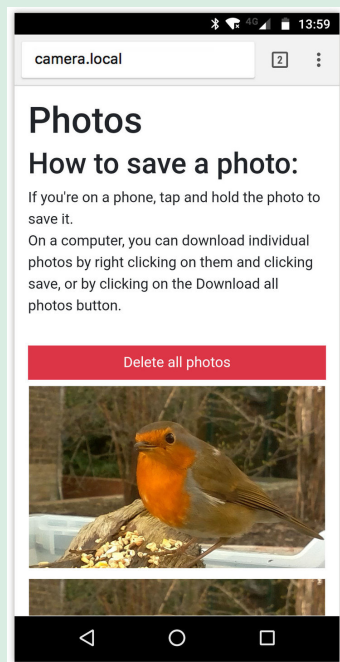
6.



By Default, the My Naturewatch Camera is set to automatically control the exposure of the image. However the exposure can be set manually if the scene has mixed lighting conditions, or if you would simply like to modify the shutter speed to create different effects.

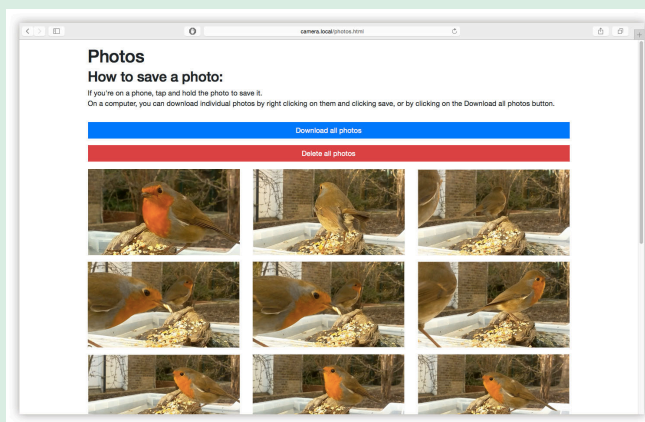
To switch to manual control, click **Settings > Exposure Mode > Manual**. Moving the slider allows you to select a number of different shutter speeds and clicking the button '**Update Manual Settings**' sends the setting to the camera.

7.



Pressing the **'Image Gallery'** button on the main screen will lead to a new page showing all the pictures the camera has captured. On a phone, save photos by tapping and holding on them. Once you have saved the ones you want, delete the photos from My Naturewatch Camera by clicking the **'Delete All Pictures'** button.

8.

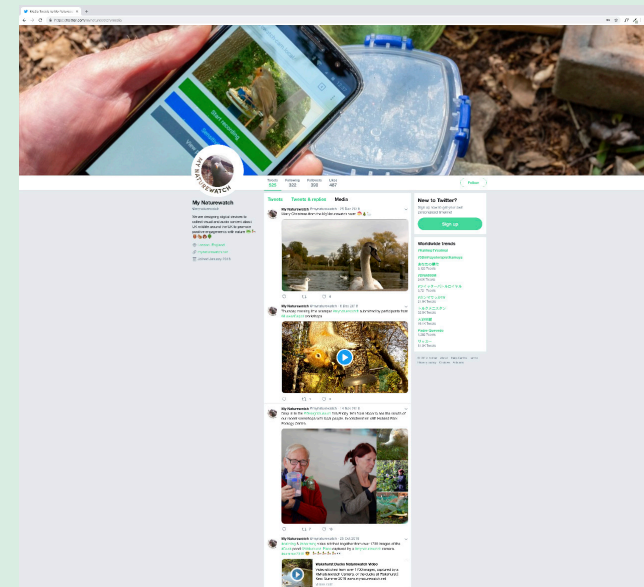


Downloading pictures works differently on computers:

On computers, you also have the option to **"Download All Photos"**. If you select this, the camera will add all the photos to a .zip file and send it to your computer.

This can take a very long time if you have many pictures – and make sure you have sufficient storage space on your computer!

9.



**Don't forget to share!**

Post your pictures to Instagram and Twitter and don't forget to tag them with **#mynaturewatch** and **#springwatch**:

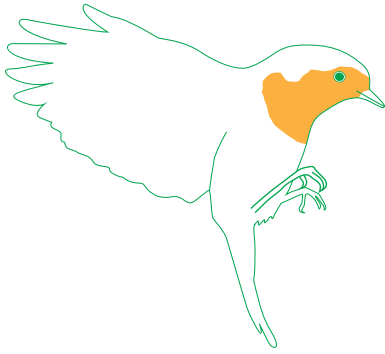
<https://www.instagram.com/mynaturewatch/>

<https://twitter.com/mynaturewatch>

See more on our gallery page and in the discussion Forum:

<https://mynaturewatch.net/gallery/>  
<https://mynaturewatch.net/forum>

# A Few Tips



- During warm weather, we do not recommend putting the My Naturewatch Camera in direct sunlight as this can lead to overheating issues.
- You do not have to remain connected to the Cameras' Wifi for it to function and continue recording.
- The battery pack of the Naturewatch Camera will have to be charged every 12 hours or so (depending on the battery).
- For best results, try to frame the image of the Camera so that the action you expect to capture will be 0.5 - 1 metre away.
- Experiment with different ways of mounting My Naturewatch Cam. Near a bird feeder, hanging in a tree, pointing at the ground...
- Try different types of bait. Lots of animals – birds, foxes, rats, badgers – like apples, for example.
- Using a wildlife camera can be like fishing: sometimes nothing bites. Be patient and keep trying!

