

COURSE

Birdwatching Fundamentals

10 Chapters

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BIRDWATCHING FUNDAMENTALS

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Birdwatching Fundamentals

Course 1 · Chapter 1 · What Birdwatching Is: Looking and Listening

You can start birdwatching today with nothing but your eyes and a window. This chapter sets out what the hobby is, the words its followers use (some of which confuse newcomers), where it came from, how many people do it, and what basic kit people use. Later chapters build on this: the equipment, how birds are put together, how to identify them, and how to take part in real surveys.

What Birdwatching Is

Wikipedia's Birdwatching article says birdwatching, or birding, is "the observing of birds, either as a recreational activity or as a form of citizen science". Watchers may use their eyes, binoculars or a telescope, or listen for bird sounds. The article says most birdwatchers do it for recreation or social reasons, while ornithologists study birds using formal scientific methods.

Birdwatcher

Anyone who watches birds for pleasure. No qualification needed.

Ornithologist

Someone who studies birds by formal scientific methods.

Citizen scientist

A watcher whose records feed real research (Chapter 9 covers this in detail; the link is mentioned in the article's definition).

The Words People Use

Term	Meaning according to the article
Birding	Used interchangeably with birdwatching by some; others prefer it because it includes listening to birds

Term	Meaning according to the article
Birder	North American term for a dedicated enthusiast; a 1969 *Birding* magazine glossary called it "the acceptable term used to describe the person who seriously pursues the hobby of birding"
Twitching	British term: "the pursuit of a previously located rare bird"; often called "chasing" in North America
Twitcher	Someone who travels long distances to see a rare bird and count it on a list

> **Not every birder is a twitcher**
>
> A common newcomer mistake is to treat the words as synonyms. A birder who walks the same park every Sunday is not twitching; twitching means going after a particular rare bird someone else has already found.

A Short History

The article traces interest in birds for their appearance and behaviour, rather than as food, to the late 18th century, naming works by Gilbert White, Thomas Bewick, George Montagu and John Clare. In the Victorian era, bird study in Britain often centred on collecting eggs and skins. Late in the 19th century, bird protection increased interest in watching living birds, and the article says the Audubon Society was started in the US and the Royal Society for the Protection of Birds in Britain (it gives no founding years, so none are stated here).

Year	Event (per the article)
1889	Florence Bailey's *Birds through an Opera Glass*, described as the earliest US field guide
1901	"Bird Watching" first appears as a book title, by Edmund Selous
1934	Roger Tory Peterson's field guide, which led to the first major increase in birding in North America
After World War II	Binoculars became more widely available

The word came after the first guide

Subtracting the years in the table by hand: Selous's book came 12 years after Bailey's guide (1901 minus 1889) and Peterson's guide 33 years after that (1934 minus 1901). So a field guide existed before the hobby had its now-familiar name, and the big North American boom followed later.

The Peterson guide's sales figures differ between sources I looked at: an Audubon feature said it eventually sold more than 2 million copies, while a mailing-list post gave more than 7 million by Peterson's death in 1996. I could not reconcile them, so treat both as unchecked. A Colby College page describes the guide's arrows pointing at field marks as its key innovation (check). Field marks are the subject of Chapter 4.

Who Takes Part

The article gives several figures from different periods and surveys: an estimate of 61 million birders in the late 1980s; a US Fish and Wildlife Service study identifying one fifth (20%) of Americans as birdwatchers; and over 45 million Americans considering themselves birders in 2016. Because they come from different years and methods, they should not be compared as a trend (my own caution; check).

The Basic Kit

The article lists typical equipment: binoculars, a spotting scope with a tripod, a smartphone, a notepad, one or more field guides, and hides (blinds) or observation towers that conceal observers or improve views.

Start with what you have

You do not need all of this at once. Eyes, ears and a notepad are enough for a first session. Chapter 2 covers binoculars and the other items in turn. The ranking of kit by importance in Exercise 3 is my own suggestion rather than the article's.

Not Yet Verified, and Sources

- **Source.** Everything attributed to "the article" comes from the first 100,000 characters (of about 135,500) of Wikipedia's Birdwatching article; the last part was not read.
- **Not in that article.** The RSPB and Audubon Society founding years; the sales figures for Peterson's guide (from other web pages, conflicting); the "field marks" innovation (check).
- **The 1889 date.** One other encyclopaedia page gives 1890 for the same book, but library catalogue records for scanned copies give 1889, so 1889 is kept (Birdwatching Fundamentals 2 explains).
- **Twitcher origin.** The article links the term to a British birdwatcher's nervous behaviour in the 1950s; I have not checked the story further (check).

Exercises

EXERCISE 1

Using the table in "A Short History", work out (a) the gap between Bailey's guide and Selous's book, (b) the gap between Selous's book and Peterson's guide, and (c) the gap between Bailey's guide and Peterson's. Say what the gaps suggest about the order in which guide, name and boom appeared.

→ Solution

EXERCISE 2

Match each of the words birding, birder, twitching, twitcher and ornithologist to the best definition, then write one sentence of your own that uses at least two of them correctly.

→ Solution

EXERCISE 3

From the kit list (binoculars, spotting scope and tripod, smartphone, notepad, field guide, hide or tower), choose the four items you would take on a very first outing and put them in order of importance, with one sentence of reasoning for each choice.

→ Solution

Quick Reference

- **Birdwatching:** observing birds for recreation or as citizen science
- **Birder vs twitcher:** a dedicated enthusiast vs someone who travels to see a located rare bird
- **1889 · 1901 · 1934:** Bailey's guide · Selous's book · Peterson's guide
- **Kit:** binoculars, scope, smartphone, notepad, field guide, hides
- **Check:** sales figures, society founding years, twitcher origin story

Coming next

Chapter 2 takes up the kit in detail, starting with how to choose binoculars.

Birdwatching Fundamentals

Course 1 · Chapter 2 · Kit and Optics: Seeing Further

Birdwatching Fundamentals 1 listed the basic kit. This chapter looks at the three items that cost the most thought: binoculars, a spotting scope and a field guide. The most useful skill is reading the two numbers printed on a pair of binoculars, such as 8×42, and knowing what they trade off against each other.

Reading the Numbers

According to Wikipedia's Binoculars article, in a description such as 8×42 the first number is the magnification and the second is the diameter of the objective lens in millimetres. The article says the objective diameter "determines the resolution (sharpness) and how much light can be gathered", so a larger objective gives a brighter, sharper image at the same magnification and quality. The cost of a larger objective is weight: the article says a 40–45 mm objective works better in low light but makes a heavier binocular than a 30–35 mm one.

Magnification

The first number. The article says 7× to 10× is typical for hand-held use, because higher powers need steadier support.

Objective diameter

The second number, in mm. Bigger gathers more light but weighs more.

Field of view

Per the article, in general inversely proportional to magnification: more zoom, narrower view, harder to find a moving bird.

Exit Pupil

The article defines the exit pupil as the objective diameter divided by the magnifying power, and says an exit pupil matching the eye's pupil (about 7 mm at night, about 3 mm in daylight) makes the best use of the light. Applying the formula by hand:

Binocular	Calculation	Exit pupil
8×42	42 ÷ 8	5.25 mm
10×42	42 ÷ 10	4.2 mm
10×50	50 ÷ 10	5 mm

Why 8×42 is popular (my reasoning, check)

The 8×42 has the largest exit pupil of the three above, so it is a good fit when light is dim, and at 8× it is steadier than the 10× pair. Whether it is the best choice for any one person depends on how they watch; the article gives no ranking, and the popularity claim is from my own general knowledge (check).

Prisms, Coatings and Eyeglasses

Feature	What the article says
Porro prisms	Z-shaped configuration; wider bodies with offset objectives and eyepieces
Roof prisms	Objectives almost or totally in line with the eyepieces; narrower and more compact. Schmidt–Pechan designs are less bright than Porro or Abbe–Koenig at the same specs, because of mirror-coated surfaces
Coatings	Anti-reflective coatings reduce light lost at each surface; "fully multi-coated" means all air-to-glass surfaces have multi-layer anti-reflective coatings. Roof prisms also need phase-correction coatings
Eye relief	Over 16 mm "should be adequate for any eyeglass wearer"; over 17 mm may be needed for thicker frames
Image stabilisation	Allows binoculars up to 20× to be hand-held, but stabilised models tend to be more expensive and heavier

Try before you buy

If you wear glasses, check eye relief against the figures above. Shops usually let you test a pair. The advice to test in the shop is mine, not the article's.

Spotting Scopes and Tripods

Wikipedia's Spotting scope article describes it as a compact, lightweight, portable telescope, usually mounted on a tripod, used for birdwatching among other things. It says magnifications usually fall between 20× and 60×, since higher powers reduce brightness, narrow the field of view and increase shake. Objectives are "typically between 50 and 80 mm", larger being heavier and dearer. Most eyepieces are removable or zoom, and either straight-through or angled (usually at 45 degrees). Because the image is sensitive to vibration, scopes are normally mounted on a tripod, or occasionally a monopod.

Do not start with a scope

A scope has a narrow view and needs setting up, so most beginners find a bird with binoculars first. This ordering is my own practical advice (check); the articles do not rank the two.

Field Guides

Wikipedia's Field guide article says a field guide helps readers identify wildlife and other natural objects and is meant to be "brought into the field". Popular guides are usually a browsable picture guide organised by family, colour, shape, location or other descriptors; scientific references follow taxonomic order. It says Peterson's 1934 bird guide placed paintings of similar species side by side with arrows marking the differences, called the Peterson Identification System, and quotes his wife Virginia Marie Peterson that artists can emphasise key features better than photographs because drawings can omit clutter.

A date, mostly settled

Birdwatching Fundamentals 1 gave 1889 for Florence Bailey's *Birds through an Opera Glass* (from the Birdwatching article). The Field guide article gives 1890 for Florence Merriam's *Birds Through an Opera-Glass*, the same book under her maiden name (her Wikipedia biography confirms the author). That biography is itself inconsistent: its lead says she

turned the profiles into a book in 1889, its body says 1890, and its bibliography lists 1889. The Internet Archive's catalogue records for scanned Houghton Mifflin copies give 1889 (I read the catalogue entries, not a title page). So 1889 is the better-supported year; a 1890 date may come from a later printing or from the book's appearance in the shops (my guess; check).

Not Yet Verified, and Sources

- **Sources.** Binoculars: first 100,000 of about 169,000 characters read, so later sections were not. Spotting scope and Field guide: the fetch tool returned summaries of the pages; I did not see the full text.
- **Not in the articles.** Why 8×42 is popular, the advice to test in a shop, and the ordering of scope after binoculars (check).
- **Not covered.** Prices, weights and brands; the articles give none and none are stated here. Sound-recording kit and apps are left to a later chapter.

Exercises

EXERCISE 1

Work out the exit pupil of an 8×32, a 10×32, an 8×56 and a 12×50, using the formula in this chapter. Which comes closest to the daylight eye pupil of about 3 mm, and which suits the night pupil of about 7 mm?

→ Solution

EXERCISE 2

Explain in a short paragraph the difference between Porro and roof prism binoculars in shape and in brightness, and say which you would choose for a day of walking, giving a reason.

→ Solution

EXERCISE 3

You are watching ducks on a lake about 300 m from the car park. Describe how you would use binoculars, a spotting scope, a field guide and a notepad, and in what order.

→ Solution

Quick Reference

- **8×42:** 8× magnification, 42 mm objective
- **Exit pupil:** objective ÷ magnification (8×42 = 5.25 mm)
- **Hand-held:** typically 7× to 10×
- **Scopes:** about 20× to 60×, tripod needed
- **Eye relief for glasses:** over 16 mm
- **Check:** 8×42 popularity; why one source says 1890 for the 1889 guide

Coming next

Chapter 3 turns from kit to the bird itself: its body parts and the words used to describe them.

Birdwatching Fundamentals

Course 1 · Chapter 3 · Bird Anatomy: Naming the Parts

Birdwatching Fundamentals 2 covered the kit for seeing birds. This chapter covers what you are looking at. Field guides and experienced birders describe a bird using a small vocabulary of body parts, so learning those words lets you describe a sighting precisely and, in Birdwatching Fundamentals 4, identify it. The chapter covers the bill, feathers, wings, tail, legs and feet, and a few facts about the body underneath.

The Parts You Will See Named

Wikipedia's Bird anatomy article labels a figure of a yellow-wattled lapwing with these parts: beak, head, iris, pupil, mantle, coverts, scapulars, tertials, rump, primaries, vent, thigh, tarsus, feet, belly, flanks, breast, throat, wattle and eyestripe. The article labels them but does not describe each one in its text, so the one-line notes below are my own general knowledge unless marked otherwise (check).

Head

Beak, eye (iris and pupil), throat and the eyestripe, a line running through the eye.

Upperparts

Mantle (the back area), scapulars, coverts, tertials, primaries and rump (check each against a field guide diagram).

Underparts

Throat, breast, belly, flanks, vent and thigh. The tarsus is the part of the leg you see above the toes.

The Bill

The article says the beak "is used for eating and for preening, manipulating objects, killing prey, fighting, probing for food, courtship and feeding young." It has upper and lower mandibles covered by a keratinised layer called the rhamphotheca. Birds lack teeth, and many chicks have

an "egg tooth" for hatching. For the watcher, the practical point is that bill shape is a clue to diet and behaviour (my own general knowledge; check).

Feathers

Wikipedia's Bird feather article names two basic types: vaned feathers (also called contour or pennaceous feathers) that cover the exterior of the body, and down feathers beneath them. It also describes:

Kind	What the article says
Flight feathers	Remiges (wing) and rectrices (tail), "the most important feathers for flight"
Down	Has no barbicels, so its barbules stay loose and trap air, which insulates
Filoplumes	Rarer, hairlike feathers beside pennaceous feathers, often hidden; "one or two" per pennaceous feather at least on the head, neck and trunk; absent in ratites
Bristles	Stiff, tapering feathers with "a large rachis but few barbs"; rictal bristles grow around the eyes and bill

A feather's structure, per the article, is a central shaft (the rachis) with barbs branching from it, barbules branching from the barbs, and tiny hooks called barbicels linking neighbouring barbules. At the base the rachis forms a hollow quill, the calamus, set in a follicle in the skin. Feathers wear out and are replaced periodically by moulting, and new feathers grow from the same follicles. The article gave no moulting schedule in the part I read.

> **Plumage outweighs the skeleton**
>
> The Bird feather article says a bird's plumage weighs "two or three times more than its skeleton". The Bird anatomy article says the skeleton is only about 5% of total body weight. Combining the two (my own arithmetic, assuming both statements apply to the same typical bird; check), plumage would be roughly 10% to 15% of body weight (2 × 5% and 3 × 5%). Treat that as an estimate only.

Wings and Tail

The Bird anatomy article says the bones in the wing are "extremely light" and that the digits are "fused together". Its wing section is only a link to a separate article, which I did not read, so details such as secondaries are not covered here (check). Tail feathers attach to the pygostyle, and muscles control the movement of the tail and the spreading of the rectrices.

Legs and Feet

The article says leg bones are the heaviest, "contributing to a low center of gravity", and lists five foot arrangements:

Type	Toe arrangement	Found in
Anisodactyl	Three toes forward, one back	Most common arrangement
Zygodactyl	Two forward, two back	Parrots and woodpeckers
Heterodactyl	Digits three and four forward, one and two back	Trogons only
Syndactyl	Second and third toes fused	Kingfishers and related Coraciiformes
Pamprodactyl	All four toes may point forward	Swifts

Keratin scales cover mainly the toes and tarsi, and the scaly covering of the foot is called the podotheca.

The Body Underneath

- "A bird's skeleton accounts for only about 5% of its total body weight", and the skull "usually weighs about 1%" of it.
- Birds are the only living vertebrates with "a keeled breastbone", which anchors the flight muscles.
- Pectoral muscles "make up about 15–25% of a flighted bird's body weight."

Words to keep apart

The tarsus is a leg bone you see as the "shin" of the bird, not a knee. A common beginner mistake is to call the visible backward-bending joint a knee (my own general knowledge; check against a field guide diagram).

Not Yet Verified, and Sources

- **Sources.** Bird anatomy and Bird feather: the first 100,000 characters of about 190,000 and 198,000 respectively were read, so later sections were not.
- **The date from Birdwatching Fundamentals 1 and 2.** Settled as 1889 using library catalogue records; one encyclopaedia page gives 1890.
- **Not in the articles as read.** What each labelled body part is, the bill-shape clue, the knee remark, and the 10% to 15% estimate (all marked check above). The semiplume feather type was not in the text I read.
- **Not covered.** Secondaries and wing shape, and the soft-part colours used in identification.

Exercises

EXERCISE 1

Name the foot type for each description: (a) three toes forward, one back; (b) two forward, two back; (c) all four toes can point forward; (d) second and third toes fused. Give one group of birds the chapter links to each type.

→ Solution

EXERCISE 2

A bird weighs 100 g. Using the percentages in this chapter, work out the skeleton weight, the skull weight, and the range of pectoral muscle weight. Then estimate the plumage weight using the "two or three times the skeleton" rule.

→ Solution

EXERCISE 3

Without looking back, list as many labelled parts of the bird as you can from the "Parts You Will See Named" list, then write a two-sentence description of a bird in your garden or a local park using at least five of them.

→ Solution

Quick Reference

- **Bill:** upper and lower mandibles, covered by the rhamphotheca; no teeth
- **Feathers:** vaned (contour) over down; flight feathers are remiges and rectrices
- **Feather structure:** rachis, barbs, barbules, barbicels, calamus
- **Feet:** anisodactyl, zygodactyl, heterodactyl, syndactyl, pamprodactyl
- **Body:** skeleton about 5%, skull about 1%, pectoral muscles 15–25% of body weight
- **Check:** the 10% to 15% plumage estimate and the plain-language notes on body parts

Coming next

Chapter 4 uses this vocabulary to identify birds: size, shape, field marks, behaviour and habitat.

Birdwatching Fundamentals

Course 1 · Chapter 4 · Identifying Birds: A Method

Birdwatching Fundamentals 3 gave you the vocabulary for a bird's parts. This chapter turns that vocabulary into a method: a sequence of questions that narrows an unknown bird down to a group and then to a species. It also covers the birders' word "jizz", the idea of field marks, and how Roger Tory Peterson's guide changed the way identification was taught.

Start With the Overall Impression

Wikipedia's article on jizz (also spelled "giss") defines it as "the overall impression or appearance of a bird". It says the impression combines shape, posture, flight style, size and coloration with voice, habitat and location. The article says experienced birders often identify birds at a glance this way, and that it is especially useful for placing a bird in a family or genus. Its example sentence is "It definitely had the jizz of a thrush, but I couldn't see what kind."

> **Where the word came from**
>
> The article says the term appeared in print in 1922, in ornithologist Thomas Coward's *Manchester Guardian* "Country Diary" column (which it dates to 6 December 1921), and in his 1922 book. Coward attributed it to "a west-coast Irishman", so the true coiner is unclear. Jeremy and Julian Greenwood are said to have debunked, in 2018, three popular explanations: a wartime air-force acronym for "General Impression of Size and Shape", the German word *gestalt*, and a contraction of "just is". The 1922 printing rules out the wartime explanation, since it came before that war. The gap between the 1922 book and the Greenwoods' 2018 article is 96 years (2018 minus 1922).

A Five-Step Method

The steps below are my own summary of common practice, not taken from one article (check against a field guide's introduction).

Step	Ask yourself	Narrows to
1. Impression	What does it remind me of (thrush-like, duck-like)?	A family or group
2. Size and shape	Compare it with a bird you know well; note bill, tail and leg proportions	A handful of candidates
3. Field marks	Eyestripe, wing bars, rump colour, bill colour	Separates look-alikes
4. Behaviour and habitat	How does it move and feed, and where is it?	Removes unlikely options
5. Sound	What song or call do I hear?	Confirms, or separates cryptic species

> **Write it down before you open the guide**
>
> Note what you saw while it is fresh, then consult the guide. Memory drifts toward the picture you have just looked at. This is common advice but is my own, not from the articles (check).

Field Marks and the Peterson System

Wikipedia's article on Roger Tory Peterson says he "developed the Peterson Identification System" and is "known for the clarity of both his illustrations of field guides and his delineation of relevant field marks". It says he published the first edition of his guide in 1934, that the book is "considered by some to be the first modern field guide", and that the initial run of 2,000 copies sold out within a week. It names a diagram of ducks by Ernest Thompson Seton in *Two Little Savages* (1903) as one inspiration.

Birdwatching Fundamentals 2 reported, from the Field guide article, that the guide placed paintings of similar species side by side with arrows marking the differences. The Peterson article itself does not explain how the system works, so that description rests on the other article.

Fact	Source article
1934 first edition; initial run of 2,000 copies sold out within a week	Roger Tory Peterson

Fact	Source article
Born 28 August 1908; died 28 July 1996, aged 87	Roger Tory Peterson
Similar species side by side, with arrows marking differences	Field guide

Checking the age: from 28 August 1908 to 28 July 1996 is one month short of 88 years, so 87 is right. He was 25 or 26 when the guide appeared in 1934 (1934 minus 1908 is 26, or 25 before his August birthday); the first edition's month is not given in the page I read (check).

Behaviour, Habitat and Sound

Wikipedia's article on bird vocalisation identification says the specificity of bird calls "has been used extensively for species identification". Vocal differences can help separate similar species, and some subspecies differences are "detectable only in the sonograms". It also says that songs are associated with territory and courtship, that calls often serve as alarms or to keep flock members in contact, and that song "is usually delivered from prominent perches". The article reports that some field guides have used sonograms since 1983 and that smartphone apps now match recordings against spectrographic databases. Chapter 5 covers sound in detail.

> **Do not force an identification**
>
> A bird seen for two seconds in poor light may not be identifiable. Saying "unidentified small bird" and recording what you did see is better than a confident wrong name (my own advice; check).

Not Yet Verified, and Sources

- **Sources.** Jizz and Roger Tory Peterson were read as summaries by the fetch tool. The bird vocalisation page: first 100,000 of about 223,000 characters. The page I looked for on general identification methods (size, shape, colour) did not cover those topics, so steps 1 to 4 are my own general knowledge (check).
- **Not in the articles.** The five-step method, the write-first advice and the "do not force it" advice.

- **Left open.** The month of the 1934 first edition, and Peterson's publisher for it, are not given in the page I read.

Exercises

EXERCISE 1

Using the dates in this chapter, work out (a) Peterson's age in 1934 if his birthday had already passed that year, and if it had not; (b) the number of years between the 1903 Seton diagram and the 1934 guide; (c) the number of years between Coward's 1922 book and the Greenwoods' 2018 article.

→ Solution

EXERCISE 2

Explain in your own words what "jizz" means and why it is useful at a glance, then explain why the wartime-acronym explanation of the word cannot be right.

→ Solution

EXERCISE 3

Pick a bird you can see from a window or in a photograph. Work through the five steps in the method table and write one line for each step. Then say which step gave you the most information and which gave you the least.

→ Solution

Quick Reference

- **Jizz:** the overall impression of a bird; in print by 1922
- **Method:** impression, size and shape, field marks, behaviour and habitat, sound
- **Peterson guide:** first edition 1934; first run of 2,000 copies sold out within a week

- **Sound:** calls and songs help separate similar species
- **Check:** the five-step method, the birth-month arithmetic for 1934

Coming next

Chapter 5 looks at bird sound: songs, calls, and how to learn them.

Birdwatching Fundamentals

Course 1 · Chapter 5 · Song and Calls: Listening

Birdwatching Fundamentals 4 ended its method with sound as step five. Often it is the first clue: many birds are heard long before they are seen, and some similar species are easier to tell apart by voice than by looks. This chapter covers the difference between songs and calls, how a bird produces and learns sound, the dawn chorus, and the tools people use to describe and record what they hear.

Songs and Calls

Wikipedia's Bird vocalization article says songs are longer and more complex and tied to territory and courtship, while calls usually serve as alarms or keep flocks in contact. It adds that some authorities classify by function instead, so that short vocalisations such as a pigeon's count as song. The earlier-cited article on identification by sound gives the same split by "complexity, length, and context".

Song

Longer, more complex; linked to territory and courtship. Often delivered from prominent perches.

Call

Shorter; alarms, or keeping flock members in contact.

Mobbing and alarm calls

Mobbing calls have wide frequency spectra, sharp onsets and repetition, making them easy to locate; most alarm calls are high-pitched and harder to locate.

How Birds Make Sound

The article names the vocal organ as the syrinx, "a bony structure at the bottom of the trachea". Birds control pitch through membrane tension, and both pitch and volume through the force of

exhalation. The two sides of the trachea can be controlled independently, which lets some species produce two notes at once.

Learning to Sing

According to the article, juveniles go through sensory learning (memorising a tutor's song) and sensorimotor learning (practising until the output matches the memory). Early singing is "sub-song", followed by "plastic song", then a stable "crystallized song" after "two or three months". It reports that Thorpe (1954) found isolated birds produce less complex songs, and that dialects arise as young birds learn details from their fathers. Zebra finches are described as age-limited learners and canaries as open-ended learners.

Repertoires and Mimicry

Bird	What the article says
Brown thrasher	Up to 3000 song types
Swamp sparrow	3 to 5 song types
Starling	Repertoire of "about 15–20 distinct imitations"
Lyrebirds, mockingbirds	Weave learned sounds into their songs
Over 400 species	Duet; in antiphonal duets the partners' calls are timed so closely that they sound like one call

The size of a repertoire

Dividing the figures above (my own arithmetic): a brown thrasher's maximum of 3000 song types is 600 times the 5 types a swamp sparrow uses at most (3000 ÷ 5), or 1000 times its minimum of 3 (3000 ÷ 3). The article gives no average for the thrasher, so this compares extremes only.

The Dawn Chorus

Wikipedia's Dawn chorus article defines it as "the outbreak of birdsong at the start of a new day", most noticeable in spring in temperate countries. It lists hypotheses for it: defending a territory, attracting a mate, or calling to the flock. Anders Pape Møller's playback experiments on black wheatears raised singing in both the same and other species, which he suggested was "social facilitation". A 2007 study in an Ecuadorian forest found that birds perched higher in the trees and with larger eyes tended to sing first, which the article suggests may reflect differences in the light they perceive. The article does not give a time relative to sunrise, so none is stated here. It also gives the first Sunday in May as International Dawn Chorus Day (check that this is still the current date).

> **Listen early in spring**
>
> The article places the most noticeable chorus in spring in temperate countries. Setting an alarm for early morning and writing down what you hear is a good exercise; the "write it down" advice is mine, not the article's.

Hearing Range and Loud Birds

- Birds hear from below 50 Hz to about 12 kHz, with maximum sensitivity at 1–5 kHz (Bird vocalization article).
- The black jacobin produces sounds at about 11.8 kHz and the western capercaillie uses infrasound at about 20 Hz.
- The white bellbird's call reaches 125 dB against 116 dB for the screaming piha, a 9 dB difference (125 minus 116).
- Oilbirds and swiftlets echolocate mainly between 2 and 5 kHz.

Describing and Recording Sound

Birders write sounds as words. The article gives the white-throated sparrow as "O sweet Canada Canada Canada" in Canada and "Old Sam Peabody Peabody Peabody" in New England, and the barred owl as "Who cooks for you? Who cooks for you all?". Such phrases are called mnemonics (the term is my label; check).

A sonogram (spectrogram) is a visual record of sound. The article says sonograms are objective, unlike descriptive phrases, but need experience to interpret. It says the Sona-Graph was marketed in 1948 and that C.E.G. Bailey demonstrated it for bird song in 1950. It also says Ludwig Koch made the first known birdsong recording in 1889, at age eight; that would put his birth year at 1881 (1889 minus 8), which I have not checked elsewhere (check). Today's apps match recordings against databases of spectrograms, per the article on identification by sound.

Playback and disturbance

Møller's experiments played recordings to wild birds. Playing recordings to attract birds can stress them, especially at nesting time. This caution is my own general knowledge, to be developed in Birdwatching Fundamentals 7 (check).

Not Yet Verified, and Sources

- **Sources.** The Bird vocalization page: the first 100,000 characters of about 222,700 were read through the fetch tool, which returned a summary, so later sections are unread. The Dawn chorus page was also a summary.
- **Not in the articles.** The word "mnemonics", the advice to write down what you hear, and the playback caution (check).
- **Left open.** Whether International Dawn Chorus Day is still held on the first Sunday in May, and Koch's birth year.

Exercises

EXERCISE 1

Using figures in this chapter, work out (a) how many times larger the brown thrasher's maximum repertoire is than the swamp sparrow's maximum, (b) the decibel gap between the white bellbird and the screaming piha, and (c) the year of birth implied for Ludwig Koch by "first recording in 1889 at age eight".

→ Solution

EXERCISE 2

Describe the difference between a song and a call, giving one function for each. Then say which you would expect to hear from a bird sitting on a prominent perch in spring, and which from a flock moving through a hedge.

→ Solution

EXERCISE 3

Spend ten minutes outside listening. For every different sound, write a mnemonic of your own (for example "chip-chip-wheee"), note whether it was a song or a call, and say whether you could see the bird that made it.

→ Solution

Quick Reference

- **Song:** long, complex, territory and courtship
- **Call:** short; alarm or flock contact
- **Syrinx:** the vocal organ at the bottom of the trachea
- **Learning:** sub-song, plastic song, crystallised song
- **Dawn chorus:** start-of-day outbreak of song; most noticeable in spring
- **Tools:** mnemonics, sonograms, recordings, apps
- **Check:** Dawn Chorus Day date, Koch's birth year, playback caution

Coming next

Chapter 6 turns to where and when to look: habitats and the seasons.

Birdwatching Fundamentals

Course 1 · Chapter 6 · Habitats and Seasons: Where and When

Birdwatching Fundamentals 4 listed habitat as a step in identification, and Birdwatching Fundamentals 5 noted that the dawn chorus peaks in spring. This chapter takes up both ideas: where to look, and how the year changes what you find. Most of its sourced material is about migration, because that is where the year most visibly reshapes the birds in front of you.

Habitat: Where to Look

The articles I read do not give a general list of habitats, so this section is my own general knowledge and should be checked against a regional guide (check). Different places hold different birds: woodland, open farmland, wetlands and shorelines, moorland and mountains, towns and gardens. Chapter 4's method uses habitat to remove unlikely options, so a duck on a pond is a likelier suggestion than a woodland songbird on open water.

Edges are rich

Hedgerows, woodland edges and shorelines often offer more variety in a short walk than the middle of a uniform area (check).

Water

Lakes, rivers and coasts attract waterfowl and waders; scopes (Chapter 2) matter most here.

Your own patch

A small place you visit often teaches the cycle of the year better than many one-off trips (my advice; check).

Why Birds Migrate

Wikipedia's Bird migration article defines migration as "a seasonal movement of some birds between breeding and wintering grounds that occurs twice a year". Food is the main driver, according to the article; some hummingbirds skip migration if they are fed through winter.

Longer northern summer days give breeding birds more time to feed their young, which allows larger clutches. These benefits offset the stress, energy cost and risk of travel.

Kinds of Movement

Type	What the article says
Long-distance	Common in northern land birds and some waterfowl; about 1,800 of the world's 10,000 bird species
Altitudinal	Up and down mountains, for example in the Andes and Himalayas; dusky grouse move roughly 400 m
Partial	Only some populations migrate; in Australia 44% of non-passerines and 32% of passerines are partially migratory
Irruption	Irregular mass movements beyond the usual range, often after a food failure; Bohemian waxwings had 18 major arrivals in Britain between 1937 and 2000
Nomadic	Irregular movement following water and food in arid regions, linked to rainfall rather than season

Share of long-distance migrants

1,800 of 10,000 species is 18% (1,800 ÷ 10,000). The article's figures for Britain's waxwing arrivals work out at 18 in 63 years (2000 minus 1937), about one every 3.5 years, so an irruption is a rare event worth watching for, not a yearly one.

Records and Routes

The article says many populations travel along a flyway, with routes that often follow mountain ranges, coastlines or rivers and may use updrafts and wind patterns. Outbound and return routes are often different. It gives these records:

- **Arctic tern:** "the longest-distance migration of any bird"; one tracked bird covered about 96,000 km in 10 months.

- **Bar-tailed godwit:** some birds make "the longest known non-stop flight of any migrant", about 11,000 km from Alaska to New Zealand, after storing 55% of body weight as fat.
- **Bar-headed goose:** GPS tracking recorded flights up to 6,540 m (21,460 ft) over the Himalayas.
- **Geese in V formation:** may save 12–20% of the energy of flying alone.

Wikipedia's Arctic tern article gives more detail: the shortest distance between its breeding and wintering areas is 19,000 km; a 2010 study of 11 birds from Iceland and Greenland found an average of about 70,900 km a year, with a maximum of 81,600 km; and a Farne Islands bird tagged "G82" covered 96,000 km in ten months in a 2015–2017 study. A chick ringed on the Farne Islands in 1982 reached Melbourne in about three months, more than 22,000 km.

> **A number that does not quite add up**
>
> The Arctic tern article estimates a lifetime distance of roughly 2.4 million km from the 2010 figures and an average lifespan of about 30 years. Multiplying the 70,900 km average by 30 gives 2,127,000 km, about 2.1 million, not 2.4 million. The 2.4 million figure would fit a yearly distance of 80,000 km, which is close to the maximum in that study (81,600 km). I could not tell which the article used, so treat the lifetime figure as approximate (check).

How Birds Find Their Way, and When They Go

The article says birds use a mix of cues: the Sun and stars, the Earth's magnetic field, visual landmarks, smell and learned mental maps. Young birds on a first migration head in the right direction using magnetic cues and learn landmarks through experience. Day length is the primary physiological cue. Caged birds show restlessness (Zugunruhe) at the usual migration time, which suggests internal annual programs.

Reading the Year as a Watcher

This table is my own general summary, not from the articles, and the details differ by country and species (check).

Season	What to expect (northern temperate)
Spring	Song at its peak; returning migrants; nest-building
Summer	Breeding; young birds; quieter song later in the season
Autumn	Southward migration; flocks gathering; rarities turning up
Winter	Visitors from further north; birds at feeders; waterfowl on open water

Keep a first-dates note

Writing down the date you first see or hear each migrant each year is a simple way to learn the pattern. Chapter 8 covers notebooks and lists; the advice here is mine.

Not Yet Verified, and Sources

- **Sources.** Bird migration: the first 100,000 of about 207,000 characters were read, via a summary by the fetch tool; the Arctic tern article was also summarised.
- **Not in the articles.** The habitat section and the season table (my own general knowledge, check).
- **Unresolved.** The tern lifetime-distance figure does not match simple multiplication (see the warning box).
- **Not used.** The Bird migration page also gave a 2026 assessment about the share of migratory species in decline; I did not use it because I could not read its context.

Exercises

EXERCISE 1

Using the numbers in this chapter, work out (a) the percentage of species that are long-distance migrants, (b) how many years of the waxwing record (1937 to 2000) passed per major arrival, and (c) the Arctic tern lifetime distance if the average yearly distance is 70,900 km and the lifespan is 30 years.

→ Solution

EXERCISE 2

Match each example to its movement type (long-distance, altitudinal, partial, irruption, nomadic): (a) dusky grouse moving about 400 m up and down a mountain; (b) a bird in arid country following rainfall over several years; (c) a mass arrival beyond the normal range after a food failure; (d) only some populations of a species leaving for winter.

→ Solution

EXERCISE 3

Choose a local place you can visit. List the habitats in it, then predict what you might see there in each of the four seasons, using the table in this chapter as a guide. Check one prediction by visiting.

→ Solution

Quick Reference

- **Migration:** a seasonal movement between breeding and wintering grounds, twice a year
- **Types:** long-distance, altitudinal, partial, irruption, nomadic
- **Long-distance:** about 1,800 of 10,000 species
- **Records:** Arctic tern (about 96,000 km in 10 months for one bird), bar-tailed godwit (about 11,000 km non-stop)
- **Cues:** sun, stars, magnetic field, landmarks, smell, day length
- **Check:** habitat notes, the season table, tern lifetime distance

Coming next

Chapter 7 covers field craft and ethics: how to approach birds without harming them.

Birdwatching Fundamentals

Course 1 · Chapter 7 · Field Craft and Ethics: Doing No Harm

A watcher can get a better view by being patient, and a worse outcome for the bird by being pushy. This chapter covers the habits that let you see more without disturbing what you came to see: how to approach, when to stay away, and why the hobby has a growing body of etiquette. It follows the kit in Birdwatching Fundamentals 2 and the method in Birdwatching Fundamentals 4, and it picks up the playback caution flagged in Birdwatching Fundamentals 5.

Why Ethics Matter Here

Wikipedia's Birdwatching article says that as the number of birdwatchers grows, so does concern about their impact on birds and habitat, and that "Birdwatching etiquette is evolving in response to this concern." It says birdwatchers can increase pressure on birds and habitats, giving examples such as stressing birds by playing their calls, drawing them out of cover, and exposing birds and nests to predators. It lists impacts including disturbance to birds, the environment and local cultures, and says methods to reduce negative impacts and strengthen conservation value are "the subject of research" without describing specific methods.

Practices the Article Lists

Practice	Why (article, unless marked mine)
Promote bird and habitat welfare	Stated as a general principle
Limit photography, pishing and playback devices	To reduce stress on birds
Keep a distance from nests and nesting colonies	Disturbance at breeding and roosting sites
Respect private property	Stated as a practice

The article cites the American Birding Association's "Code of Birding Ethics", dated 3 January 2020 on the page (I have not read the code itself, so I give no wording from it; check). It names no other code in the part I read. A reader in another country should look for a local code from a national bird or birdwatching organisation (my suggestion; check).

Playback and pishing

Playing a recording of a bird's call can draw it out of hiding and stress it, according to the article, which lists playback among practices to limit. The article also names "pishing" (making sounds to attract birds) in the same sentence. I have not found a firmer rule in the part I read, so the safest reading is: avoid it with rare, nesting or heavily watched birds (my judgement; check).

Field Craft: Approaching Birds

The advice in this section is my own general knowledge, not taken from the articles (check):

- **Move slowly and quietly.** Sudden movement and bright clothing flush birds; muted colours help.
- **Use optics, not feet.** If you need to move closer to see detail, your binoculars or scope (Chapter 2) are probably not powerful enough, or the bird is too far to be worth chasing.
- **Watch the bird's behaviour.** Alarm calls, head-up posture or leaving the spot are signs to back away.
- **Let birds come to you.** Sitting still beside a feeding spot or a path edge often works better than walking.

Hides and Towers

The article describes hides and observation towers as used to conceal observers from birds and also to improve viewing conditions. Using an established hide, where one exists, lets you watch without moving toward the birds. The article does not discuss how to behave inside one; quiet and no sudden movements are my own suggestions (check).

Reporting Sightings and Trust

The article says rare-bird records are hard to prove, so birders try to build trust in their own identifications, and it cites the Hastings Rarities case as one of the few major disputes. It also says the online recording site eBird hides sightings of some sensitive species, and quotes a 2018 article title about "censoring sightings for 325 At-Risk Species". Taken together, the point is that

a sighting can be both a record and a risk to the bird, if a location is revealed (my reading; check).

Conservation and money

The article says birdwatchers contribute to conservation through citizen science, and gives North American birdwatching spending of $36 billion in 2006 and $32 billion in 2001, so the 2006 figure is $4 billion above the 2001 figure ($36 billion minus $32 billion). The article does not adjust for inflation or say how the figures were defined, so I treat the comparison as rough (check).

A Short History of Protection

The article says the Audubon Society was started in the United States to protect birds from the growing trade in feathers, and was against the killing of birds. It says the RSPB in Britain initially opposed organised birdwatching, calling the "scientification" of the pastime "undesirable", and that "this stand was to change only in 1936", when Tom Harrisson and others took over. That is 35 years after Selous's 1901 book (1936 minus 1901, from Birdwatching Fundamentals 1).

Not Yet Verified, and Sources

- **Sources.** Wikipedia's Birdwatching article: the first 100,000 of about 135,500 characters were read; the fetch tool could not show the rest, so any final-section material on ethics is not reflected.
- **Not read.** The American Birding Association code itself, and any national code in another country.
- **Not in the article.** The field craft list, the advice on hides, the interpretation of sensitive-species hiding, and the local-code suggestion (all marked check).
- **Money figures.** The 2006 and 2001 totals are quoted as the article gives them; I have not checked the original source.

Exercises

EXERCISE 1

Using the figures in this chapter, work out (a) the change in North American birdwatching spending between 2001 and 2006 in billions and as a percentage of the 2001 figure, and (b) how many years passed between Selous's 1901 book and the 1936 change of direction at the RSPB.

→ Solution

EXERCISE 2

A friend wants to play a recording of a rare bird's call to bring it out of a bush for a photograph. Write a short, polite reply that explains the concern, using the points from "Practices the Article Lists", and suggests an alternative.

→ Solution

EXERCISE 3

Draw up your own personal code of five rules for birdwatching, each with a one-line reason, drawing on this chapter. Then say which rule you think would be hardest to follow and why.

→ Solution

Quick Reference

- **Distance:** keep away from nests and nesting colonies
- **Playback and pishing:** limit; they can stress birds and draw them from cover
- **Property:** respect private property
- **Hides:** conceal observers and improve viewing
- **Records:** rare records are hard to prove; some sensitive sightings are hidden
- **Check:** the field craft list, ABA code wording, money figures

Coming next

Chapter 8 covers notes, lists and records: how to keep a notebook and a life list.

Birdwatching Fundamentals

Course 1 · Chapter 8 · Notes and Lists: Keeping Records

Birdwatching Fundamentals 1 listed a notepad in the basic kit, and Birdwatching Fundamentals 6 suggested noting first-arrival dates. This chapter explains why watchers keep records and the three forms they take: a field notebook, personal lists (life lists and big years), and shared checklists that feed a large public database. The record-keeping habit is what turns an enjoyable walk into something you can learn from, and, if shared, something scientists can use.

The Field Notebook

The articles I read say nothing about how to lay out a notebook, so this section is my own general knowledge (check). A useful entry holds the date, time, place, weather, what you saw or heard and how many, and a note on what you could not identify. Writing down what you saw before opening the guide (Birdwatching Fundamentals 4) and sketching a field mark you cannot name both help later.

> **One line is enough**
>
> A brief entry written every time beats a perfect notebook used once a month. This is my own view, not from an article.

The Life List

Wikipedia's Life list article defines it as "a list of all biological species seen by a person", and calls the practice lifelisting. It is most common among birdwatchers and fishermen. The article says each person decides what counts: some count only birds they see, others accept a bird heard. Because no one can verify another person's list, it "relies on the honor system", and adding birds seen only online or in film is generally discouraged.

> **A list can change after you finish it**
>
> The article says reclassifying one species into two, or the reverse, can retroactively change a completed list. It gives the first person to record over 8,000 species, Phoebe Snetsinger,

whose total has been revised to 8,398 because of such changes. It does not say what her total was before revision, so I cannot say how much it moved.

The Big Year

Wikipedia's Big year article defines it as "a personal challenge or an informal competition" in which birders try to identify as many species as possible "by sight or sound, within a single calendar year". It lists records for the ABA area (the North American area used by the American Birding Association) and for the world.

Year	Who	Total
1939	Guy Emerson	497 (earliest known continent-wide record)
1956	Stuart Keith	594 (stood fifteen years)
1987	Sandy Komito	722
1998	Sandy Komito	745, later revised to 748
2013	Neil Hayward	747 plus 3 provisionals
2016	John Weigel	836 in the "New ABA" region, after Hawaii was added

World big year	Who	Total
2008	Alan Davies and Ruth Miller	4,341
2015	Noah Strycker	6,042
2016	Arjan Dwarshuis	6,852 (current record per the article)

The article notes that the counting area and accepted records can change, as with the addition of Hawaii and the 1998 revision when state committees accepted three more birds. It also records criticism from environmentalists that big years ignore the ecological impact of travel, and a family who used only bicycles in 2007 and recorded 548 species, which they called a "bird year". Differences worked out by hand: Dwarshuis beat Strycker by 810 (6,852 minus 6,042) and

the 2008 couple by 2,511 (6,852 minus 4,341). I have not checked the totals beyond this article (check).

Shared Checklists: eBird

Wikipedia's eBird article calls it an online database of bird observations that gives scientists and amateur naturalists real-time data on bird distribution and abundance. It launched in 2002, started by the Cornell Lab of Ornithology and the National Audubon Society, added New Zealand in 2008 and covered the world from June 2010. Participants record which species they see and how many, and submit them online or by mobile device. The article says statistics count only complete checklists, where the observer reports every species they can identify during the outing.

Figure from the article	Value
Checklists worldwide, 29 February 2024	103,758,820
From North America	70,966,901 (68.4%)
Observations by 12 May 2021	over one billion
Observations per year in recent years	over 100 million

The article lists uses: studies of migration and India's monsoon, of distribution change linked to climate change, and of migration routes. One study found lists accurate for estimating trends and distribution when an area had 10,000 checklists. The data are free and feed other databases. It also reports biases: urban data skews toward higher-income neighbourhoods, pandemic restrictions made the data more urban, and most submissions fall on weekends.

> **Why "complete" matters**
>
> A checklist that lists only the exciting birds says nothing about which birds were absent. A complete checklist shows absence as well as presence, which is what the article says lets eBird document both (my reading; check). Birdwatching Fundamentals 7 raised the separate question of hiding sensitive sightings.

Not Yet Verified, and Sources

- **Sources.** Life list, Big year and eBird were read as summaries by the fetch tool, not as full text.
- **Not in the articles.** Notebook layout and habits, the "one line" advice and the "complete checklist" reading (check).
- **Unchecked.** All record totals are from one article each and are not confirmed elsewhere. They are records as of the articles' last edits and may have been beaten since.
- **Left open.** Snetsinger's total before reclassification; eBird's number of users.

Exercises

EXERCISE 1

Using the tables, work out (a) how many more species Komito's 1998 revised total of 748 was than his 1987 total of 722, (b) the percentage of eBird checklists from North America, using 70,966,901 out of 103,758,820 (round to one decimal place), and (c) the gap between Keith's 1956 total and Emerson's 1939 total.

→ Solution

EXERCISE 2

A friend says "I counted the eagle I saw on a nature documentary on my life list". Using the chapter, explain what the article says about counting rules and about this specific practice, and say how you would settle what counts for your own list.

→ Solution

EXERCISE 3

Design a one-page notebook layout (columns or headings) for a single outing, then fill it in for a ten-minute watch in a place you can see. State whether your list is complete and why that matters.

→ Solution

Quick Reference

- **Life list:** every species you have seen; rules are your own; honour system
- **Big year:** most species in one calendar year, by sight or sound
- **Records:** ABA area 836 (2016, New ABA); world 6,852 (2016)
- **eBird:** launched 2002; complete checklists count in statistics
- **Notebook:** date, time, place, weather, species, numbers, unknowns
- **Check:** totals beyond one article, notebook advice

Coming next

Chapter 9 looks at citizen science: counts, surveys and how your records are used.

Birdwatching Fundamentals

Course 1 · Chapter 9 · Citizen Science: Counts That Count

Birdwatching Fundamentals 8 ended with shared checklists. This chapter goes further: how organised counts turn the observations of ordinary watchers into data that scientists use, what a long-running example looks like, and where volunteer data is strong and weak. You do not need to be an expert to contribute, but you do need to count carefully and honestly.

What Citizen Science Is

Wikipedia's Citizen science article describes it as research conducted with the participation of the general public, amateur or nonprofessional researchers. It quotes the Oxford English Dictionary (added June 2014): "scientific work undertaken by members of the general public." It says involvement ranges from contributory roles (collecting data, classifying information) to co-creation and "extreme citizen science", where volunteers help set goals or lead projects. It adds that birds are the most commonly observed group in biodiversity citizen science data.

The Christmas Bird Count

Wikipedia's Christmas Bird Count article gives the origin: in December 1900 the ornithologist Frank Chapman "proposed counting birds on Christmas instead of killing them", in place of the Christmas "side hunts" in which people "competed at how many birds they could kill". The article calls it the world's longest-running citizen science survey and says the National Audubon Society runs it with Bird Studies Canada and others.

Count	Observers	Places	Other
First (1900)	27	25	18,500 birds of 90 species
101st (2000-01)	52,471	1,823	17 countries
113th (2012-13)	71,531	2,369	latest figures in the article

Each count is held in a circle "with a diameter of 15 miles (24 kilometres)", on any day from 14 December to 5 January inclusive. Volunteers follow set routes and count every bird they see, and

in most circles some people also watch feeders. The data give population information for conservation biology and winter-range data that complement breeding surveys.

> **How big is a count circle?**
>
> A circle 15 miles across has a radius of 7.5 miles, so its area is about 177 square miles (3.14 × 7.5 × 7.5, worked by hand). That is about 458 square kilometres, using 2.59 square kilometres per square mile; the article's "24 kilometres" is a rounded conversion. The area is my own calculation (check).

Garden and Feeder Surveys

The Citizen science article lists several bird projects: Project FeederWatch (affiliated with the Cornell Lab of Ornithology); NestWatch, which tracks nesting, eggs, hatching and chick survival with observations every 3 to 4 days; and hawk-watchers who count migrating raptors each spring and autumn. It also says the RSPB's Big Garden Birdwatch began in 1979 and that in 2024 over 600,000 people counted almost 10 million birds. (I tried a separate encyclopaedia page for the Birdwatch and it could not be found, so only the Citizen science article's figures are used; check.) Dividing, that is an average of about 16 or 17 birds per person (10 million ÷ 600,000), if both figures are taken as given; the article says "almost" and "over", so the average is approximate.

What Volunteer Data Does Well

- Volunteers can cover far larger areas and timeframes than individual researchers.
- Theobald et al. (2015) surveyed 388 biodiversity projects and estimated 1.36 million to 2.28 million annual volunteers.
- Kosmala et al. (2016) concluded that volunteer datasets can be "reliably high quality, on par with those produced by professionals."
- European breeding bird survey data feeds the Farmland Bird Index, which the EU adopted as a sustainable development indicator.

Where It Falls Short

Concern	What the article says
Training	Without proper training, volunteer data may introduce bias (Thelen and Thiet, 2008)
Accuracy	Varies with task difficulty and experience; an open question
Trust	In a survey of more than 1,500 students (Mitchell et al., 2017), only a third agreed that citizen-collected data was reliable
Who takes part	Most participants are White adults with above-average income and university degrees
Remedy	Statistical methods and best practices can address many errors and biases

The two sources need not agree

The Citizen science article says volunteer data can be as good as professional data; it also records concerns about bias and trust. Both statements are in the same article. Read them together: well-designed, trained and checked projects can produce good data, and ones without those can not (my summary; check). Birdwatching Fundamentals 8 gave the eBird article's bias warnings, which fit the same pattern.

How to Take Part Well

- **Count completely.** Record every species you can identify, not just the interesting ones (Birdwatching Fundamentals 8).
- **Follow the project's method.** A set route and a set time make your count comparable with other people's (my reasoning; check).
- **Record what you did not identify.** Honest "unknown" is better than a guess (Birdwatching Fundamentals 4).
- **Protect the birds.** The ethics in Birdwatching Fundamentals 7 apply to counting too.

Not Yet Verified, and Sources

- **Sources.** The Christmas Bird Count article was read as a summary and its latest participation figures are for 2012-13. The Citizen science article: the first 100,000 of about

283,000 characters were read through a summary, so most of its later sections are unread. A third page I tried could not be found.

- **Unchecked.** The Big Garden Birdwatch figures come only from the Citizen science article. Whether any figure is more recent than the articles' last edits is unknown.
- **My own.** The circle area, the average birds per person and the participation advice (check).

Exercises

EXERCISE 1

Using the table, work out (a) how many times more observers there were in the 113th count than in the first, (b) the average number of observers per place in the 101st count (round to one decimal), and (c) the percentage rise in places from the 101st to the 113th count (round to the nearest whole number).

→ Solution

EXERCISE 2

Explain in a short paragraph why a citizen-science count asks every volunteer to follow the same method, and give one way volunteer data could be biased according to this chapter.

→ Solution

EXERCISE 3

Plan a one-hour count of the birds in your garden, local park or from a window. Say where you will stand, when you will count, what you will do about birds you cannot identify, and how you would share the result.

→ Solution

Quick Reference

- **Citizen science:** research with the participation of the general public
- **Christmas Bird Count:** began 1900; circles 15 miles (24 km) across; 14 December to 5 January
- **Other projects:** FeederWatch, NestWatch, hawk-watching, Big Garden Birdwatch (from 1979)
- **Strength:** large areas and long periods
- **Weakness:** bias without training, variable accuracy, narrow participation
- **Check:** recent participation figures, my derived averages

Coming next

Chapter 10 is the capstone: planning and running your first local survey.

Birdwatching Fundamentals

Course 1 · Chapter 10 · Capstone Survey: Your First Local Survey

This last chapter introduces no new facts from outside sources. It asks you to use what the earlier chapters set out, planning a small survey of a local place, running it carefully and writing it up so someone else could repeat it. Every step points back to the chapter it comes from; the survey design itself is my own suggestion and should be adapted to your place and any scheme you join (check).

Step 1: Choose a Patch

Birdwatching Fundamentals 6 suggested a small place visited often, such as a park, a stretch of shoreline or a garden. Choose one you can reach easily and safely, and list its habitats. Check whether you need permission to be there (Birdwatching Fundamentals 7: respect private property).

Step 2: Prepare Your Kit

Item	From	Use
Binoculars	Birdwatching Fundamentals 2	Finding and identifying birds; a pair with 7× to 10× magnification is typical for hand-held use
Field guide	Birdwatching Fundamentals 2	Narrowing down look-alikes
Notebook and pencil	Birdwatching Fundamentals 8	Recording every entry
Optional scope and tripod	Birdwatching Fundamentals 2	Distant water birds

Step 3: Fix Your Method

Write down your rules before you start, as a project would (Birdwatching Fundamentals 9): the same route, the same start time and duration, and the same counting rules each visit. A simple scheme is a one-hour walk, once a month, counting every bird you can identify by sight or sound (Birdwatching Fundamentals 8 and 5), with the largest number seen at once for each species. Decide in advance what you will do with birds you cannot identify (record them as unknown, per Birdwatching Fundamentals 4).

> **Choose what to ask**
>
> A survey is stronger if it asks a question: Which birds visit the feeder in winter? When do the first migrants return (Birdwatching Fundamentals 6)? Does the pond hold different birds in each season? The examples are mine.

Step 4: Run It

- Arrive at the same hour, preferably early in the morning (Birdwatching Fundamentals 5 notes that the dawn chorus is most noticeable in spring, in temperate countries).
- Use the five-step method (Birdwatching Fundamentals 4): impression, size and shape, field marks, behaviour and habitat, sound.
- Keep your distance from nests, do not use playback, and move quietly (Birdwatching Fundamentals 7).
- Record date, time, weather, and the birds, with numbers and whether each was seen or heard.

Step 5: Write It Up

For each visit, write the date, the conditions, the species list and numbers, and a note on anything unusual. After several visits, make a table of species against months, as the sample below shows. The numbers are made up to show the layout, not real observations.

Species	Jan	Feb	Mar	Notes
Species A	4	5	3	Seen at the feeder
Species B	0	1	6	Returning migrant?

Species	Jan	Feb	Mar	Notes
Species C	2	0	0	Winter visitor?

Reading the sample table

Species A totals 12 over the three months (4 + 5 + 3), Species B 7 (0 + 1 + 6) and Species C 2 (2 + 0 + 0), 21 in all. Species B rising from 0 to 6 might suggest an arrival in spring, and Species C might be a winter visitor, but three visits are far too few to be sure. Keeping the survey going for a full year (Birdwatching Fundamentals 6) is what would test those guesses.

Step 6: Share It

If you submit your checklists to an online scheme, submit complete lists (Birdwatching Fundamentals 8), and think before revealing the exact location of a sensitive species (Birdwatching Fundamentals 7). A local group or national organisation may also welcome a year's records (my suggestion; check).

What the survey cannot show

A single person's survey of one small place shows what you found there, not what the wider bird population is doing. Volunteer data has strengths and limits (Birdwatching Fundamentals 9), and the same limits apply to yours.

Not Yet Verified, and Sources

- **Sources.** This chapter draws only on the earlier chapters, whose own sources and caveats apply. No new web sources were read.
- **My own.** The survey design, the table of made-up numbers and the advice to share records (check).
- **Carried forward.** The earlier chapters' "(check)" items still stand, including unconfirmed record totals and the sources read only in part.

Exercises

EXERCISE 1

Choose a patch and write a one-page survey plan: the place and its habitats, the dates and times, the counting rules, how you will handle unidentified birds, and the question your survey asks.

→ Solution

EXERCISE 2

Run one visit following your plan and write up the entry. Then calculate the total number of birds counted and the number of species, and say what you would change in the plan for the next visit.

→ Solution

EXERCISE 3

Using the sample table, work out the monthly total for January, February and March (all species added together), and say which month had the highest total. Then list three reasons why three months of data from one patch cannot show a trend.

→ Solution

Course complete

You now have the whole sequence: what the hobby is, the kit, the bird's parts, a method for naming birds, sound, habitats and seasons, field ethics, records and lists, citizen science, and a survey of your own. Keep the notebook going.

Quick Reference

- **Plan:** patch, kit, fixed method, a question

- **Run:** same route and time, five-step method, ethical distance
- **Record:** date, time, weather, species, numbers, seen or heard
- **Share:** complete lists; think about sensitive locations
- **Limits:** one patch cannot show a wider trend
- **Check:** survey design, sharing advice