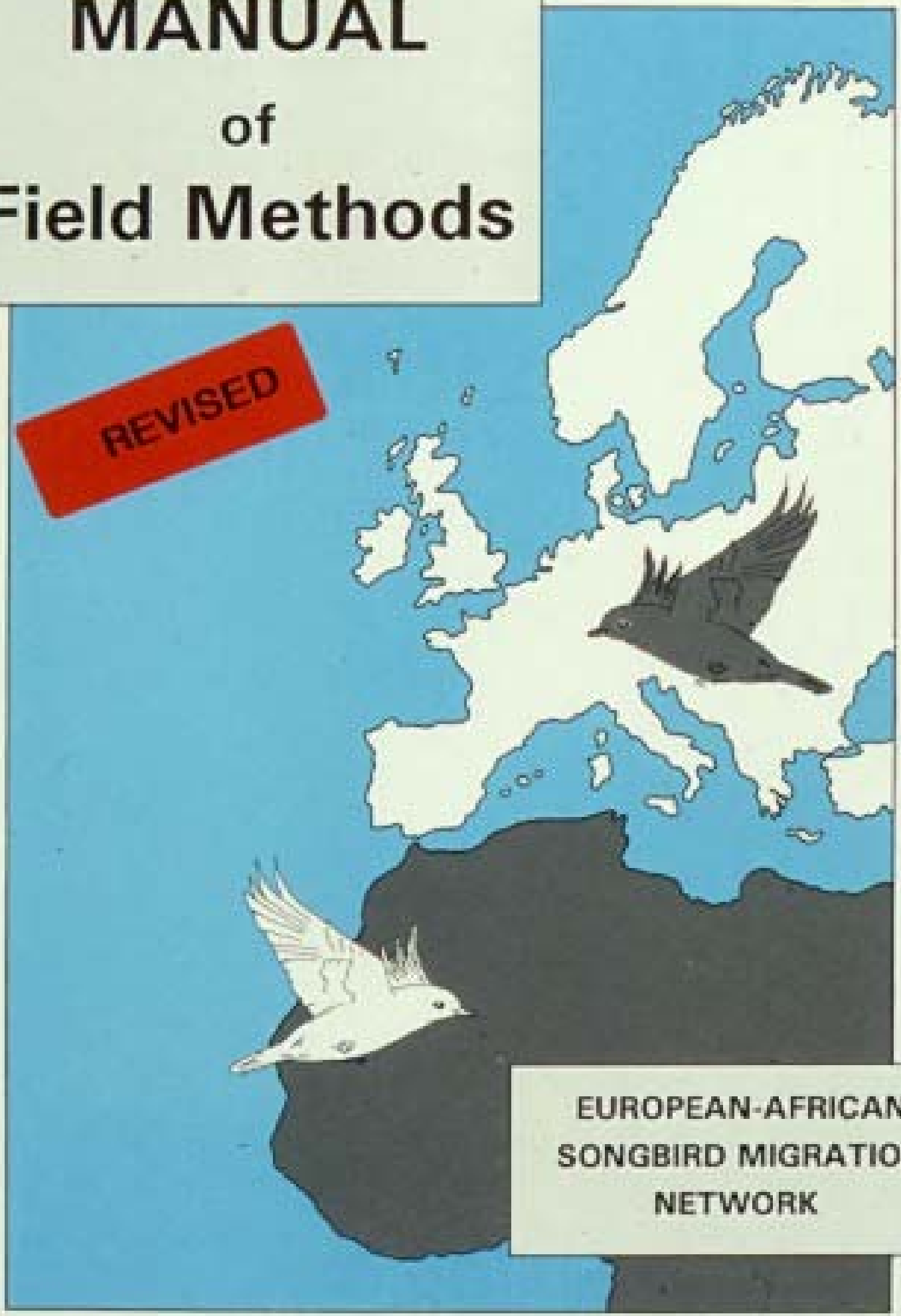
MANUAL of Field Methods

REVISED



EUROPEAN-AFRICAN SONGBIRD MIGRATION NETWORK

EUROPEAN-AFRICAN SONGBIRD MIGRATION NETWORK

Manual of Field Methods

revised edition

compiled by

Franz Bairlein

with contributions by

Lukas Jenni
Andreas Kaiser
Lennart Karlsson
Arie van Noordwijk
Will Peach
Andrea Pilastro
Fernando Spina
Göran Walinder

Supported by the

EUROPEAN SCIENCE FOUNDATION

Wilhelmshaven, Germany

1995

Project Coordinator:

Franz Bairlein Institut für Vogelforschung 'Vogelwarte Helgoland'
An der Vogelwarte 21
26386 Wilhelmshaven
Germany

Introduction

Each year millions of Palaearctic breeding songbirds migrate to Afro-tropical wintering grounds. Due to many recoveries of ringed birds the principal migratory routes for some species are fairly well-known. Despite this basic information, little is known about the detailed spatial and temporal course of migration as well as the detailed analysis of environmental factors in the control of avian migration.
Flying is an energetically expensive activity. Successful migration depends on the storage of energy fuel for the migratory flights. The principal fuel for migratory flights in birds is fat. To fuel flights between successive sites along the migratory route many migrants must store large amounts of fat as energy before departure. For the Palaearctic migrants wintering in tropical Africa, an appropriate fuelling is essential before they are leaving for their trans-Saharan journey.
Where and when Palaearctic migrant songbirds energetically prepare for migration, however, is not well known. It may depend on the strategies used by various species to cover their long migratory distances. Not only different species show different migration strategies. Even within a species, birds of various origin (various populations), the sexes or different age groups may exhibit quite different migration tactics. This "differential migration" (i.e. the intraspecific variation in migratory birds with respect to seasonal timing of migration, and distribution during the non-breeding season), may result from either the starting of migration at different times, migration along different routes, different migration speed, or dissimilar stopover behaviour. Information on the temporal sequence of migration shown by populations, by sex and by age groups, however, is very sparse, and even contradictory.
Moreover, the species-specific migration strategies may be quite different in autumn and spring, respectively. In some species, migration routes in autumn and spring differ. In addition, the timing and urge of migration are different during autumn and spring migration, respectively. And even the ecological conditions at the staging sites may be very different in both seasons.

To evaluate the specific migratory routes, to identify the important fueling areas, and to elaborate the species-specific energetic and ecological conditions during stopover and at the wintering grounds are not only of fundamental scientific importance. They are also a prerequisite for conservation programmes. In many migratory birds, particularly long-distance migrants, there is a strong link between changes in the number of breeding birds and the ecological conditions during migration and on the wintering grounds in sub-Saharan Africa. However, for most species we have only very fragmentary information on these relationships.

Several very successful regional or national projects already exist. These projects are using their sub-set of species, and their own procedures in trapping and taking measurements. Contacts between research groups in Europe have been occasional, despite the fact that there is a very strong need for coordinated work to identify and to conserve the major stopover sites.

Therefore, the recent Network has been launched to obtain significant progress in this important field of bird migration research by an integrated collaborative approach, including existing national or regional activities and complementary activities within a framework of highly standardized collaborative work.
The proposed Network aims to improve our knowledge of the spatial and temporal course, the energetics and the ecology of songbirds migrating to W-African wintering areas, with special emphasis on intraspecific variation in the migration of age groups, sexes, and populations of different origin and undertaking different patterns of migration. It further aims to stimulate complementary international cooperative research on bird migration.

Key questions to be addressed are:
- What are the routes, timing, and stopover sites used by Palaearctic migrants ?
- Where do they originate ?
- Where do Palaearctic migrants prepare for migration by fattening up ?
- What are the ecological requirements at the fattening areas ?
- Where do Palaearctic migrants winter in W-Africa ?
- To what extent do Palaearctic migrants exhibit temporal movements within the general African wintering area ?

The significance of the proposed collaboration is in its comparative nature. To compare different species, different populations, different seasons, the ecological quality of different migratory stopover sites, and various wintering sites in different geographical locations is the most efficient way to strengthen research on bird migration and to reveal the migratory strategies birds adopted to encounter their seasonal environments.

The goals of the Network will be accomplished by

- the analysis of the seasonal and diurnal patterns of occurrence of migrants at the particular study sites along the migration route and at the W-African wintering grounds;
- the comparative analysis of biometrical measurements which are likely to reflect population-specific differences in body features;
- the comparative analysis of body mass and fat reserves (fat score) at the various study sites.

Data on the habitats used by the birds, and on their diets will be gathered specifically and complementarily during the regular operations. The required methods of investigation are highly standardized.

The same list of "target-species" will be surveyed by the use of standardized methods of trapping the birds, and the determination of body mass, of fat reserves, and of external morphometrical characters.

All data gathered within the *Network* will be entering into a central **Network Data Bank** (NDB) which will

- support Network members in computerisation of the data,
- compile all data obtained within the Network,
- derive regular data reports and preliminary analyses,
- be responsible for the final data statistics and report.

The NDB will also encourage rapid data analysis by supplying the complete set of raw data for further analysis. The Network Coordination Committee aims to encourage and to designate participants to analyse and to write up particular aspects of the work.
After computerisation, each joining "project" may receive copies of its particular data set, or particular basic summary statistics.

List of target species

The list of target species includes the long-distance trans-Saharan migrants and their closely-related medium to short distance species of selected groups which contain species with a wide European distribution and differing migration strategies. The selected groups are the most obvious candidates for the proposed subject of interest.

English name	Latin name	Code
Nightingale	*Luscinia megarhynchos*	LUSMEG
Bluethroat	*Luscinia svecica*	LUSSVE
Red-breasted Flycatcher	*Ficedula parva*	FICPAR
Collared Flycatcher	*Ficedula albicollis*	FICALB
Pied Flycatcher	*Ficedula hypoleuca*	FICHYP
Spotted Flycatcher	*Muscicapa striata*	MUSSTR
Black Redstart	*Phoenicurus ochruros*	PHOOCH
Redstart	*Phoenicurus phoenicurus*	PHOPHO
Whinchat	*Saxicola rubetra*	SAXRUB
Stonechat	*Saxicola torquata*	SAXTOR
Grasshopper Warbler	*Locustella naevia*	LOCNAE
Savi's Warbler	*Locustella luscinoides*	LOCLUS
Sedge Warbler	*Acrocephalus schoenobaenus*	ACRSCH
Aquatic Warbler	*Acrocephalus paludicola*	ACRPAD
Marsh Warbler	*Acrocephalus palustris*	ACRPAL
Reed Warbler	*Acrocephalus scirpaceus*	ACRSCI
Great Reed Warbler	*Acrocephalus arundinaceus*	ACRARU
Olivaceous Warbler	*Hippolais pallida*	HIPPAL
Icterine Warbler	*Hippolais icterina*	HIPICT
Melodious Warbler	*Hippolais polyglotta*	HIPPOL
Dartford Warbler	*Sylvia undata*	SYLUND
Subalpine Warbler	*Sylvia cantillans*	SYLCAN
Sardinian Warbler	*Sylvia melanocephala*	SYLMEL
Orphean Warbler	*Sylvia hortensis*	SYLHOR
Whitethroat	*Sylvia communis*	SYLCOM
Lesser Whitethroat	*Sylvia curruca*	SYLCUR
Garden Warbler	*Sylvia borin*	SYLBOR
Blackcap	*Sylvia atricapilla*	SYLATR
Bonelli's Warbler	*Phylloscopus bonelli*	PHYBON
Wood Warbler	*Phylloscopus sibilatrix*	PHYSIB
Chiffchaff	*Phylloscopus collybita*	PHYCOL
Willow Warbler	*Phylloscopus trochilus*	PHYTRO
Red-backed Shrike	*Lanius collurio*	LANCOL
Woodchat Shrike	*Lanius senator*	LANSEN

Other species might be processed if the handling of the above mentioned programme species is **n o t** affected. Handling of the target species is of highest priority.

Study period and trapping periods

The onset and the end of the **trapping period** at the particular ringing site has to be chosen in a way that the **entire migration period** of all the Network Target Species is covered.

For autumn migration, trapping will run from July to late September in the north, and from mid to late August to November/December in the south. Netting operations in W-Africa will run from October to April. In spring, netting in the south should be carried out from March to May, and consecutively later further north.

Site description

For each ringing site, a sketch map (best 1:2500) should be prepared, extending to at least 100 metres beyond the net-sites. These maps have to show the local topography, the habitats, and the mist net-sites. Aerial photographs may be included.
Further notes should be given to longitude and latitude, and altitude.
Moreover, a list of the daily times of sun-rise and sun-set at this particular site has to be provided.

Habitat recording
(use the habitat recording form)
The habitats have to be sketched on a map and all net positions must be indicated.
Habitat details should be recorded for each net. Habitat should be recorded in a 20m area on each side of each net. In cases where a single net extends into two distinct neighbouring habitats, habitat details will be recorded separately for the two sections of the net.
If nets are very close to each other, habitat recording closer than 20 m each side of the net is recommended.
Habitat has to be recorded in spring and autumn separately (preferably at the beginning of the season), and the date of habitat recording must be recorded. If there are considerable within-season changes in habitat, additional recordings must be done.

For each side of each net record 9 habitat codes as follows.
Further notes and comments can be recorded in the "notes" box on the recording form.

Habitat 1 (code 1)		**Habitat 2** (code 2)	
A	REEDBED	**1**	Mainly Reeds (*Phragmites* spp)
		2	Mainly Reedmace (*Typha* spp)
		3	Mainly Rushes (*Juncus* spp)
		4	Mainly Sedges (*Carex* spp)
B	MIXED SCRUB & REEDS	**1**	Mainly Reeds (*Phragmites* spp)
		2	Mainly Reedmace (*Typha* spp)
		3	Mainly Rushes (*Juncus* spp)
		4	Mainly Sedges (*Carex* spp)
		5	Mainly bushes
C	WET SCRUB	**1**	Mainly bushes without reeds
		2	Mainly bushes with reeds
		3	Mainly herb layer
		4	Half bushes, half herb layer
		5	Mainly grass layer
D	DRY SCRUB	**1**	Mainly bushes
		2	Mainly herb layer
		3	Half bushes, half herb layer
		4	Mainly grass layer

E	WOODLAND	**1**	Broadleaved with scrub (bushes) layer
		2	Broadleaved without scrub (bushes) layer
		3	Coniferous with scrub (bushes) layer
		4	Coniferous without scrub (bushes) layer
		5	Mixed with scrub (bushes) layer
		6	Mixed without scrub (bushes) layer
F	OTHER	**1**	Mountaintop
		2	Heathland
		3	Acid bog
		4	Isolated patch of scrub or trees in open habitat
		5	Farmland
		6	Saltwater marsh
		7	Other (please specify)

Height (code 3)
Average maximum height of the vegetation within 20m of the net.

1 Less than 1.5m
2 1-2m
3 2-3m
4 3-6m
5 6-9m
6 Greater than 9m

Standing Water (code 4)
Presence and depth of standing water in the area 20m either side of the net.

1 Dry (no standing water)
2 Dried out (was wet earlier in the season) (N.B. season = spring or autumn)
3 Standing water - depth 1-10cm
4 Standing water - depth 11-30cm
5 Standing water - depth 31-100cm
6 Standing water - depth >100cm
7 Flowing water - small stream (depth < 20cm)
8 Flowing water - river (depth > 20cm)

Presence of fruit (code 5)
Presence of berries and other fruit in the area 20m either side of the net

0 No fruit
1 Some fruit (less than 100 berries within 20m of net)
2 Much fruit (more than 100 berries within 20m of net)

Type of fruit (code 6 & 7)
List the two commonest fruits.

0 No fruit
1 Juniper (*Juniperus* spp)
2 Yew (*Taxus* spp)
3 Holly (*Ilex* spp)
4 Spindle (*Euonymus* spp)
5 Buckthorn (*Rhamnus catharticus* & *Frangula alnus*)
6 Brambles (*Rubus* spp; includes raspberry, blackberry, strawberry)
7 Roses (*Rosa* spp; includes dog rose and sweet briar)
8 Cherries and Plums (*Prunus* spp; includes blackthorn, wild cherry)
9 Hawthorn (*Crataegus* spp)
10 Sorbus shrubs (*Sorbus* spp; includes rowan, whitebeam)
11 Gooseberry family (*Ribes* spp; includes blackcurrant and redcurrant)

12 Sea Buckthorn (*Hippophae rhamniodes*)
13 Misteltoe (*Viscum album*)
14 Strawberry Tree (*Arbutus unedo* and other Rhododendron shrubs)
15 Ivy (Araliaceae family like *Hedera helix*)
16 Olive family (includes Privet *Ligustrum vulgare* and cultivated olive *Olea europaea*)
17 Nightshades (*Solanum* spp; includes *S. nigrum* and *S. dulcamara*)
18 Honeysuckle family (Caprifoliaceae incl. Elderberry *Sambucus* spp, *Viburnum* spp, *Lonicera* spp)
19 *Salvadora* spp (Africa)
20 *Nitraria* spp (Africa)
21 Introduced/exotic species (e.g. *Myoporum*)
22 Mixed fruit (use this code if more than 2 species are common)
99 Unknown (use this code if you do not know the names of the fruit)

Habitat Management (code 8)

0 No management
1 Annual 'cut-back' of vegetation around the nets (for standardization purposes)
2 Main vegetation completely cut back at least once per year (e.g. burning or reed cutting)
3 Grazing by domestic animals
4 Coppicing on woodland
5 Normal forest management
9 Unknown

Example of a habitat record:

The code: *C 1 3 3 2 1 18 6 1* represents wet scrub (C), mainly bushes without reed (1), tall bushes (3-6m) (3), some standing water (1-10cm) (3), some fruit (2), mainly elder berries (18) and blackberries (6), and with annual 'cut-back' of vegetation around the nets (1).

Trapping site and field work

The principal method of trapping within the Network is by the use of **mist-nets**, although funnel traps may be used at some sites.

TAPE-LURING is **not** allowed at any times on ESF netting sites including tape-luring for non-target species.

Standardized Netting

Type of net in use
Do not use nets with different mesh sizes or number of shelves.
For each net, net-length, number of shelves, and mesh size have to be recorded.

Net positions
Nets should be set in different habitats.
Each net will be mapped and numbered. The positions will n o t change.
If nets are taken down they have to be replaced in the same place, and the same net-length must be used.
You may use tape to mark the position of the lower and upper height of the net.

If your station is operated during both autumn and spring migration, make sure that at least part of the mist nets can be placed at the same positions each season. However, if this is not possible (e.g. due to cutting of reed beds) you may change the net positions between, but certainly not within, season.
In order to find the net positions each season, mark the position of the net poles by sticks or other appropriate means.

In order to easily record the net number of each bird caught, mark the net number at each net pole (e.g. with white self-adhesive numbers). Series of nets may be most conveniently numbered by the same first digit (e.g. series one: 11-15; series two: 21-27 etc.).

Opening of nets and net rounds

NETS should be opened continously every day from sunrise to sunset.
If the nets are not continuously opened, all nets should be opened at least one full hour before sunrise. Netting should last at least 5 hours from sunrise every day. If the nets are closed during the night, they should be closed at the same time each day, preferabely after sunset.

Frequency of **NET ROUNDS** should comply with the rules and recommendations of the ringing scheme in whose country trapping is taking place. At the very least net rounds should be made every full hour. Preferably, start the net round about 10 min before the full hour, so that the majority of the birds are taken out of the nets about 10-15 min after the full hour.

During heavy rain, strong wind or at extreme ambient temperatures nets may be closed. The number of nets closed and closing hours of the nets must be recorded every day.

The birds of all net rounds within an hour (usually one round) are recorded for the hour during which they have entered the net. For example, birds taken out of the nets during the net round starting at 9 (or 8.50) are recorded in the ringing schedules for 8 o'clock, since they have entered the nets between 8.00 and 9.00. Use local time and summer time. It will be the task of the project data manager to transform it to standard time.

Preferably, each bird is put in a separate bird bag, together with a piece of paper on which the net number is written immediately after the bird is taken out of the net. Experience has shown that this is most efficiently done when each person checking the nets carries a pad of small pieces of note-paper and a pencil (preferably both attached to string and the string attached to the person). When ringing, the ringer takes out the piece of paper together with the bird (and may give it directly to the person writing the ringing data).

Data recording

At the ringing base, the following details will be recorded on forms for each bird, at a **two-level protocol**.

Level 1 Data:
These data must be recorded for **every bird of the target species**.
(For priorities in case of too many captures, see below).

ring number
trapping status
species
date of capture
time of capture
net-number
age
sex
moult
feather-length (F8)
wing-length (maximum chord)
weight
fat score
muscle score
ringer

Level 2 Data:
Recording highly recommended but not obligatory. Sub-sampling recommended.
(Use separate schedule.)

tarsus-length
wing-shape
moult-card

Retraps and controls:
Please record all data for all retraps and controls (own or foreign).
This is important for following the development of e.g. weight, moult and fat score in individuals and for checking measuring accuracy within and between ringers.

Also record the ringer who took the measurements in retraps and controls (use initials). Make sure that birds ringed by other ringers are reported to your National Ringing Scheme by yourself.

Dead birds:
Birds which die in the net or during handling should be recorded as well and the death indicated in the comments column. Please weigh dead birds and store them in a deep freezer. They will be analyzed for body composition and they are very useful to calibrate the fat and muscle scores.
Please contact F. Bairlein for further instructions.

Instructions

Level 1 Data

Ring number (columns 1-8):

Trapping status (Rtype; column 9):
- f = first trapping
- r = retrap: within-site retraps from the same season
  - For within-day retraps less than 5 hours from the last catch only ringnumber and time should be recorded.
  - Within-day retraps more than 5 hours from the last catch should be fully recorded as they can provide data on fattening.
- c = control: birds ringed at the site during previous seasons.

Species (columns 10-15)
The use of a 6 letter code is recommended, using the first three letters of each Latin name (see list of species). Except of Marsh Warbler and Aquatic Warbler there are no duplicates in the first three letters of Latin name.
(If you should use local bird names, please provide a list for transformation).

Date of capture (columns 16-21)

Time of capture (columns 22-25):
The birds of all net rounds within an hour (usually one round) are recorded for the hour during which they have entered the net. For example, birds taken out of the nets during the net round starting at 9 (or 8.50) are recorded in the ringing schedules for 8 o'clock, since they have entered the nets between 8.00 and 9.00. Use local time and summer time (1 p.m. = 13 etc.).
(If you should use an other time recording, please give further details.)

Net (columns 26-27):
Record the net number.

Age (column 28):
According to EURING code:
- 1 = first year bird, unable to fly freely
- 2 = age unknown, able to fly freely
- 3 = first year bird: full-grown bird born in the breeding season of this calendar year
- 4 = after first year; year of birth otherwise unknown
- 5 = second year bird: full-grown bird born last calender year, now in its second calendar year
- 6 = after second year bird: full-grown bird born before last calendar year; year of birth otherwise unknown

Hence, up to 31 December, unaged, "young" and adult birds are coded 2, 3 or 4, respectively; from 1 January onwards, they are coded 4, 5 or 6 respectively.
See separate list for general ageing criteria.

Sex (column 29):
Use Svensson's Guide for sexing criteria. Do not indicate the sex, if you are uncertain about it.
- 0 = unknown
- 1 = male
- 2 = female

Moult of body feathers (columns 30-31):

In order to distinguish birds before and during moult (probably local birds) from birds with a completed moult (potentially ready for migration), the intensity and the progress of body feather moult is recorded.

Moult intensity of body feathers (column 30):
Examine the bird for growing body feathers (without considering feathers of head, wings and legs) with a single quick blow each on the upper- and underparts.

0 =	No body feathers growing
1 =	A few body feathers growing: up to about 20 growing feathers. This particularly concerns birds after the main moult which often show a few growing body feathers.
2 =	Many body feathers growing (more than about 20). This includes feathers growing due to the completion of the juvenile plumage in birds just after fledging.

Progress of body feathers moult (column 31):
This is done only in first year birds (and birds of unknown age). In adults, recording the progress of body feather moult is of little value for this study. In adults with a partial moult, progress of body feather moult is difficult to record, and they may migrate during active body feather moult. In adults with a complete moult, moult of the primaries (which is recorded in column 32) is a sufficiently good indication of moult progress. Body feather moult of adults may be recorded on moult cards (see below).

J =	Juvenile bird just fledged, primaries still growing.
U =	Body feathers mainly unmoulted old (juvenile plumage): less than one third of the body feathers moulted.
M =	Between one third and two third of the body feathers moulted.
N =	Body feathers mainly moulted: more than two thirds of the body feathers renewed.
-	Leave blank if undecided.

Moult of primaries (column 32):
This code gives a simple indication of the state of primary moult, but needs no counting of primaries. More detailed data about moult are very welcome on special moult cards (see below).

0 =	No primary growing, undecided whether all unmoulted or moulted.
1 =	No primary growing, all unmoulted (old).
2 =	Primary moult in progress: at least one primary shed or growing. Primaries with only sheaths at the base not counted. Please indicate obvious accidental loss of feathers in the comments.
3 =	No primary growing, all moulted (new).
4 =	No primary growing, partly moulted, partly unmoulted (arrested primary moult; e.g. in some *Sylvia communis*).

Feather-length of the third outermost primary (feather F8) (columns 33-35):
In order to overcome problems with different methods of taking wing-length and because feather length is directly comparable between live birds and museum skins, the feather-length of the third outermost primary was chosen as the main and obligatory measurement of size (see Berthold & Friedrich 1979, Vogelwarte 30: 11-21; Jenni & Winkler 1989, Bird Study 36: 1-15). Measuring feather length is quickly and accurately done when observing the following instructions (Figure 1):

Use a ruler with a vertical pin of exactly 1.4 mm diameter (Figure 1 A).
The ruler has to be fixed onto a block of wood or onto the table and the bird has to be held with both hands. Do not held the ruler free-hand. By using this method the inter-observer variance of the measurement is significantly reduced.
Some of the rulers may have bad zero stops. Please check carefully if you are using several rulers within one site.

Hold the wing at the carpal joint between your thumb and index finger (Figure 1 B). Take the second outermost primary (F9) with the other hand and open the wing slightly and place the pin between 2nd and 3rd outermost primaries (Figure 1 C) until it firmly touches the skin. This point is easily found and well defined.
The primary now has to be completely straightened by first bending it outward a little (to get maximum length) and the length **read to 0.5 mm**.
Make sure not to interfere with the primary coverts, i.e. the primary covert should be on the same side of the pin as the corresponding primary.
Do not use excessive force, and be as cautious as possible to avoid any injuries.

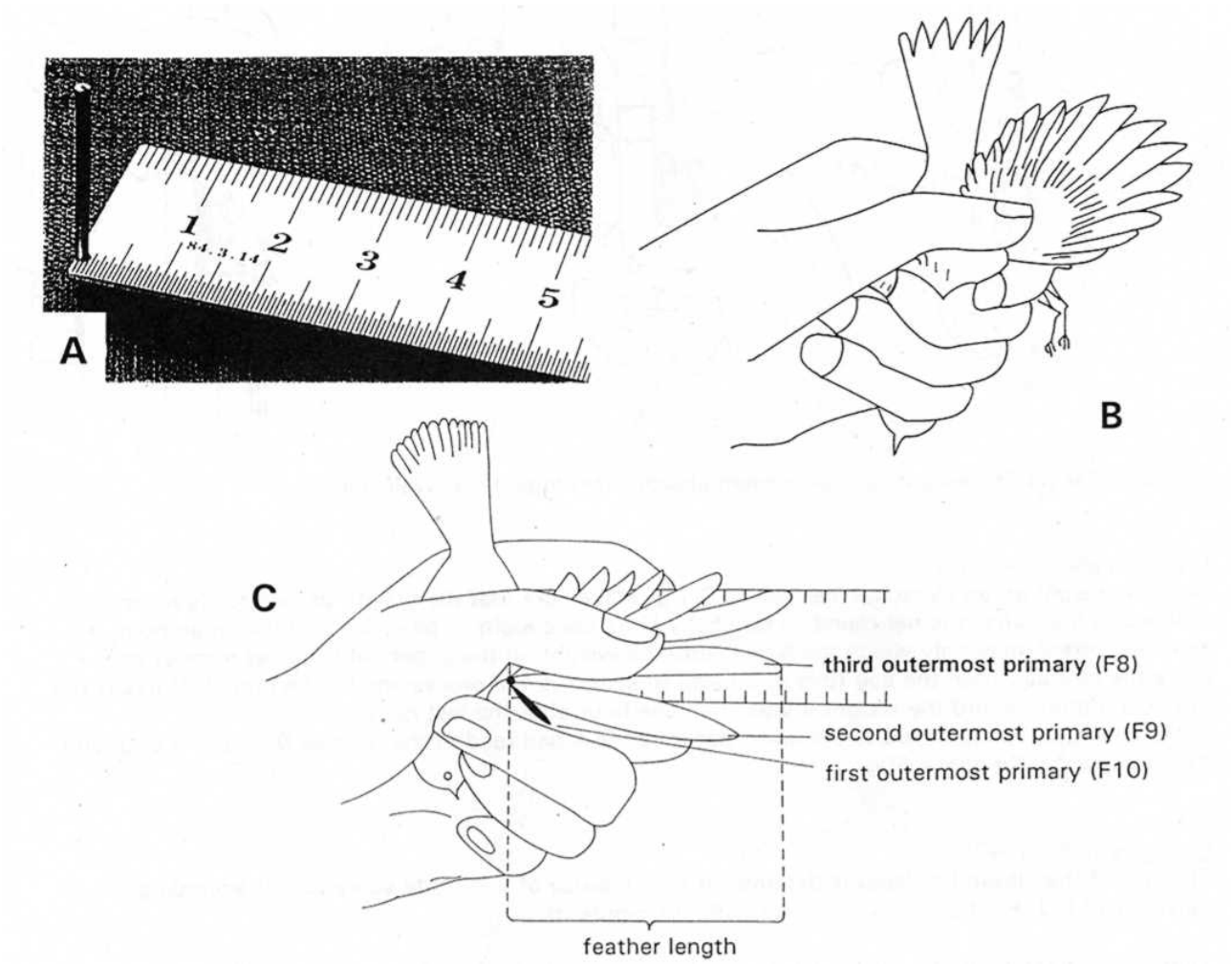


Figure 1: Taking the feather length of the 3rd outermost primary (F8).
A: Ruler with a vertical pin (from Jenni & Winkler 1989).
B: Holding the bird.
C: Measuring the feather length.
(Drawings after Vogelwarte Radolfzell, unpublished).

Wing-length (columns 36-39) (Figure 2):
Do not replace feather-length by wing-length, rather measure wing-length in addition to feather-length.

Wing-length is determined as maximum chord which is the length of the flattened and straightened wing, and it is the distance between the bend of the wing and the longest primary. Use a ruler with a stop at zero. **Read to 0.5 mm**.
Some of the rulers may have bad zero stops. Please check carefully if you are using several rulers within one site.

The wing should be folded ("resting position"; Figure 2 A). The wing is then flattened against the ruler with a gentle pressure on the primary coverts with a thumb. The primaries are straightened by pushing the thumb sideways (Figure 2 B 1) until the primaries are parallel with the ruler (B). It's also of good help to adjust the position of the primaries with your index (B 2) or ring finger (B 3).
Straighten the wing, still flattened against the ruler by strokes with the thumb outwards along the shafts of the primaries. Do not move the bend of the wing off the zero stop. Do not use excessive force, and be as cautious as possible to avoid any injuries to the fragile wing bones and muscles.

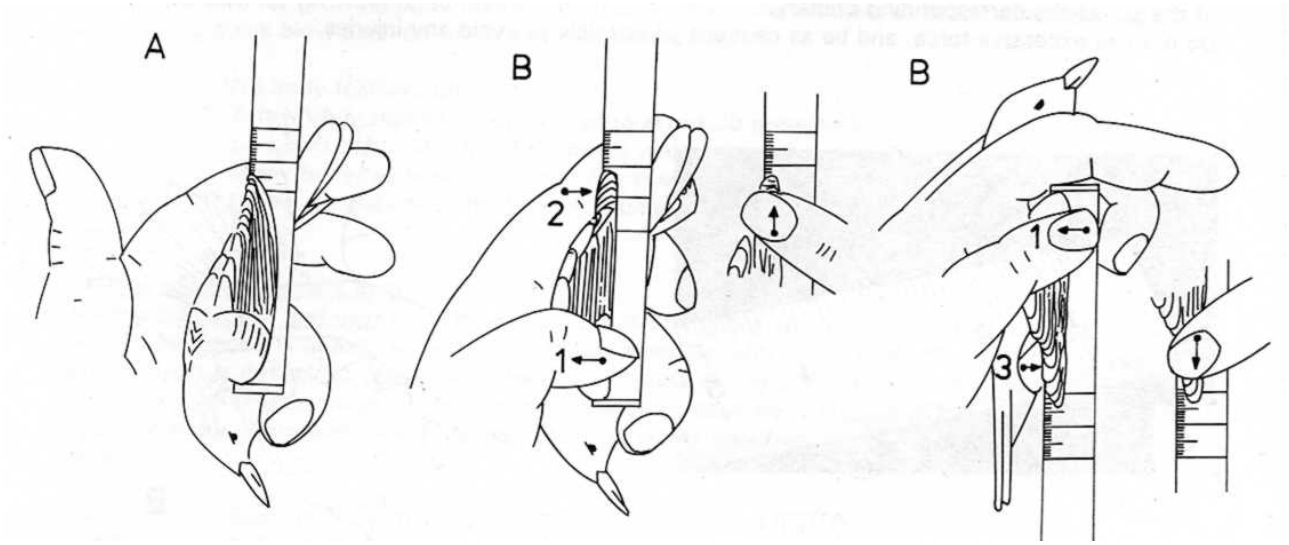


Figure 2: Taking the wing-length (maximum chord). Drawings by G. Walinder.

Weight (columns 40-42):
Recorde weight on an electronic balance to 0.1 g. Make sure that the weight of all birds is recorded within one hour after the net round. If too many birds are caught to be processed within an hour, a separate person may only weigh the birds. Note the weight on the paper with the net number and place the bird back into the bag (this also helps to speed up the processing by the ringer). If this is not possible, do not record the weight if later than one hour after the last net round.
In the case that spring balances are used, use a PESOLA and read to the nearest 0.1g up to 50g, and to the nearest 0.5g above 50g.

Fat score (column 43):
The size of the visible fat depot is determined with the use of a 9-grade score (0 - 8) according to Kaiser (1993, J. Field Ornithol. 64: 246-255; see Figure 3).

Two of the most important visible fat deposits are checked, the furcular (intraclavicular depression, "tracheal pit") and the abdominal. A specific positioning of the bird's body is necessary to make the determinations. The bird is laid on its back in one hand, and the legs are held by the other hand. The neck must be stretched slightly so that the furcular deposit is well visible, and the feathers must be blown aside. Legs of the bird should be spread aside, not pulled up or down - it will move the fat.
Additional requirements are (1) the use of bright light, which intensifies the contrast between yellowish fat layers and red muscle tissue, and (2) the determination of the amount of the visible fat before the bird is weighed to avoid biasing the measuring process.

The scores from 0 to 8 are taken in the following manner using the subclass description (see Table).
At first, estimate the fat class at the furcular region. For example, if the furcular is "filled", i.e. not concave or convex bulging, the subclass corresponds to 4.00, 4.25 or 4.50.
Secondly, check the abdominal area. If the fat deposit covers abdominal structures completely, and the liver is not visible, but the abdominal fat layer is not convex bulging, total fat score is 4.
However, some individuals do not follow the progress in fat deposition as shown in Figure 2. For example, the abdominal area may have a slightly rounded pad of fat with intestinal loops not visible (3.50), while the

furcular depression is still not completely covered with fat (1.75). Thus, the average amount of fat score is 2.6, recorded as main fat score 3.
Use only main fat classes 0 to 8.

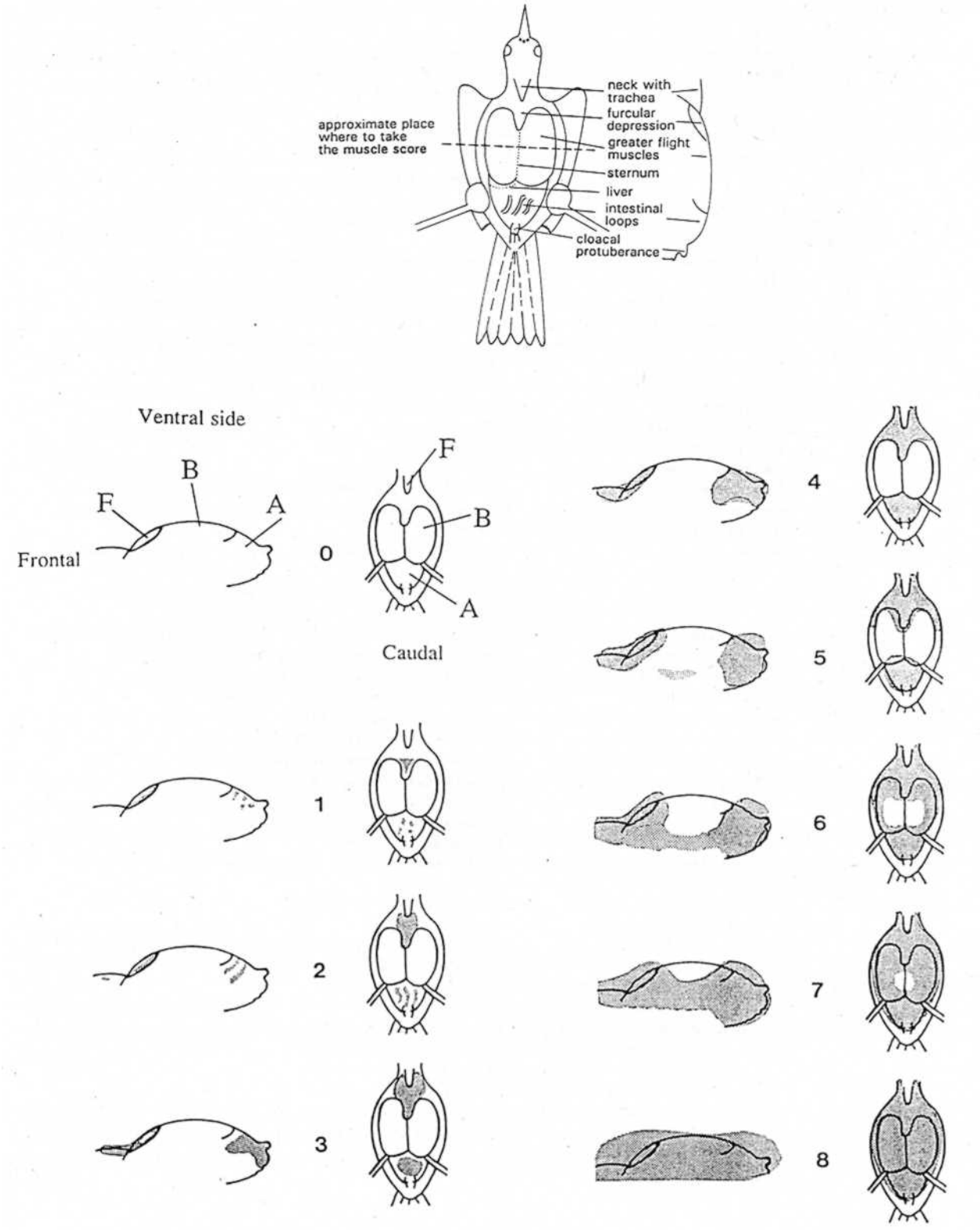
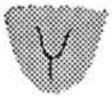


Figure 3: Fat score classes 0-8. Fat = stippled areas. F = furcular (interclavicular) depression, B = breast muscle, A = abdomen (from Kaiser 1993, modified).

Table: Description of the fat classes (from Kaiser 1993).

Table: Description of the fat classes (from Kaiser 1993).

Main class	Subclass		Furcular depression	Abdomen	Color of the considered areas
0	0.00		no fat	no fat	dark red
	0.25		barest trace, very narrow stripe	fat deposits not yet delimited	red
	0.50		small stripe	fat deposits not yet delimited	red
	0.75		wedge-shaped	small trace, patchy	light red
1	1.00		wide wedge	trace, very small stripes around intestinal loops (< 1mm)	light red
	1.25		half of furcular depression is covered	trace, stripes 1 mm wide	yellow-red
	1.50		almost completely covered with fat	trace, stripes smaller than intestinal loops	yellow-red
	1.75		small amount, almost completely covered with fat	wide stripes (2 mm)	yellowish
2	2.00		completely covered, shape deeply concave	slips of visceral fat, area between intestinal loops completely filled	light yellow
	2.25		completely covered, shape deeply concave	some subcutaneous lipid, not yet forming a pad	light yellow
	2.50		completely covered, shape deeply concave	very small pad	light yellow
	2.75		completely covered, shape deeply concave	small pad, at least 2 or 3 intestinal loops still visible	light yellow
3	3.00		moderate fat reserves cover ends of interclavicles	flat pad, one loop still visible	light yellow
	3.25		concave	slightly rounded pad, one loop sometimes visible	yolk-yellow
	3.50		still concave	slightly bulging, loops completely covered	yolk-yellow
	3.75		almost filled	bulging, liver visible	yolk-yellow
4	4.00		filled up to distal portion of interclavicles	conspicuously bulging (2-4 mm), liver sometimes visible	.
	4.25		filled up to distal portion of interclavicles	further increase in bulge (4-5 mm), liver sometimes visible	.
	4.50		filled up to distal portion of interclavicles	abdominal structures completely covered, liver not visible	.
	4.75		slightly bulging with central depression (concave)	abdominal structures completely covered and bulging	.
5	5.00		convex bulge	extreme convex bulge, increasing thickness	.
	5.25		just covering flight muscles from either furc. or abdomen	extreme convex bulge, increasing thickness	.
	5.50		covering border of flight muscles a few mm	covering border of flight muscles a few mm	.
6	6.00		covering flight muscles by several mm	covering abdominal part of flight muscles by several mm	.
	6.50		fat reaches flight muscles from sides of wings		.
	6.75		fat covering flight muscles conspicuously		.
7	7.00		three quarters of flight muscles covered		.
	7.25		large rounded fat-free area in middle of breast		.
	7.50		small rounded fat-free area (red)		.
	7.75		very small fat-free area still visible		.
8	8.00		flight muscles not visible, fat layer covers underside/ventral side of the bird completely		.

Muscle score (column 44) (Figure 4):
Beside fat which is the primary energy fuel for migrating birds, migrants also use muscle proteins in flight. The size of the breast muscle is a further valuable indicator for body condition in migrants.
In birds whose flight muscles are not covered by fat the shape of the breast muscles can be easily recorded and scored. Muscle score is assessed visually and by sweeping your thumb over the sternum. Please see figure 3 for the place where to determine muscle score.

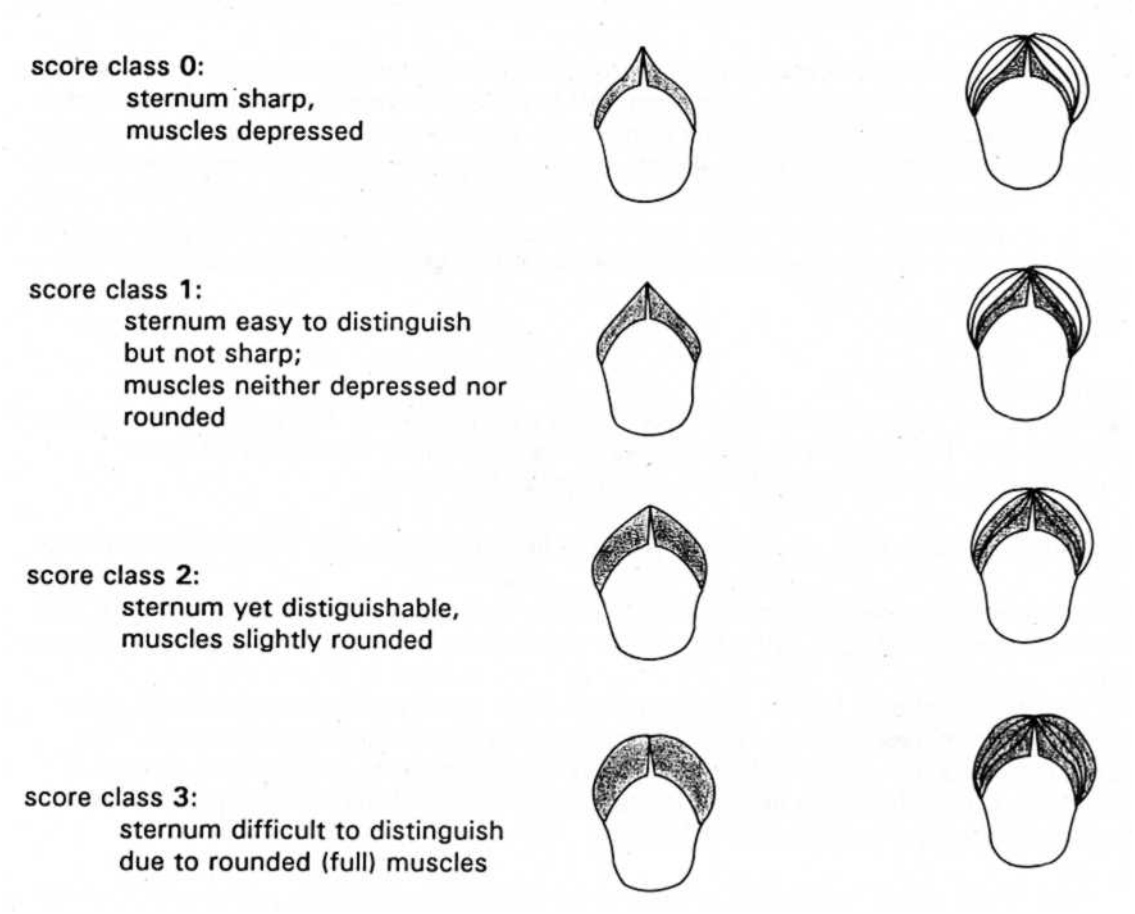


Figure 4: Taking the muscle score. The right column shows the relative difference between the scores. The stippled area are the muscles.
Drawings by Göran Walinder, Falsterbo B.O., based on studies on live birds trapped for ringing and a few dissected ones.

Level 2 (column 45):
Please tick, if level 2 data are collected on the separate schedule.

Ringer (column 46-47):
It is vital that the ringer (the person who takes the measurements) is recorded for each bird. Use initials.

Comments (column 48...):
All birds should be carefully checked for fault bars. Conspicuous fault bars should be recorded. Please note also any malformations, broken or accidently lost remiges, etc.

Level 2 Data

Level 2 Data are not obligatory but they are highly recommended because they enable much more sophisticated analyses. Please try to recorde as many of these data as possible.
On quiet days, almost each bird of the target species may be processed. On busy days a sub-sampling should be adopted.

Sub-sampling: Try to get (measure) at least 10 birds per species in each ten-day period. In species where age and/or sex can be determined, try to measure 10 birds for each group per ten-day period.
Sub-sampling abundant species will give more time to measure each bird of the rarer species.
For these additional data, separate schedules (and in the case of moult, special moult cards) are to be used.

Repeat ring number (columns 1-8), species (columns 9-14), and date of ringing (columns 15-20) from level 1 data schedule.

Tarsus-length (column 21-23) (Figure 5):
The following instructions for measuring tarsus are for a right handed person. For a left handed person reverse left and right hands. The position of the right leg of the bird will be somewhat different.
Use easily running slide calipers, and be careful not to bend the tibiotarsus.

1. Take the bird in your left hand, lying on its back, with the head between your index finger and your middlefinger.
2. Take the right (meta)tarsus between thumb and index-finger, fold the toes backwards and also hold them between thumb and index-finger. For birds with a very short tarsus one should use the extreme tips of the fingers.
3. Position the tip of the middlefinger behind the tibiotarsus, such that the tibiotarsus makes a right angle to the body and the metatarsus makes a right angle to the tibiotarsus (see Figure 5a). This positioning greatly improves the within and between observer repeatability of the measurement.
4. Make the measurement from the notch on the metatarsus to the top of the bone above the folded toes (see Figure 5b), and **read** the calipers **to 0.1mm**.

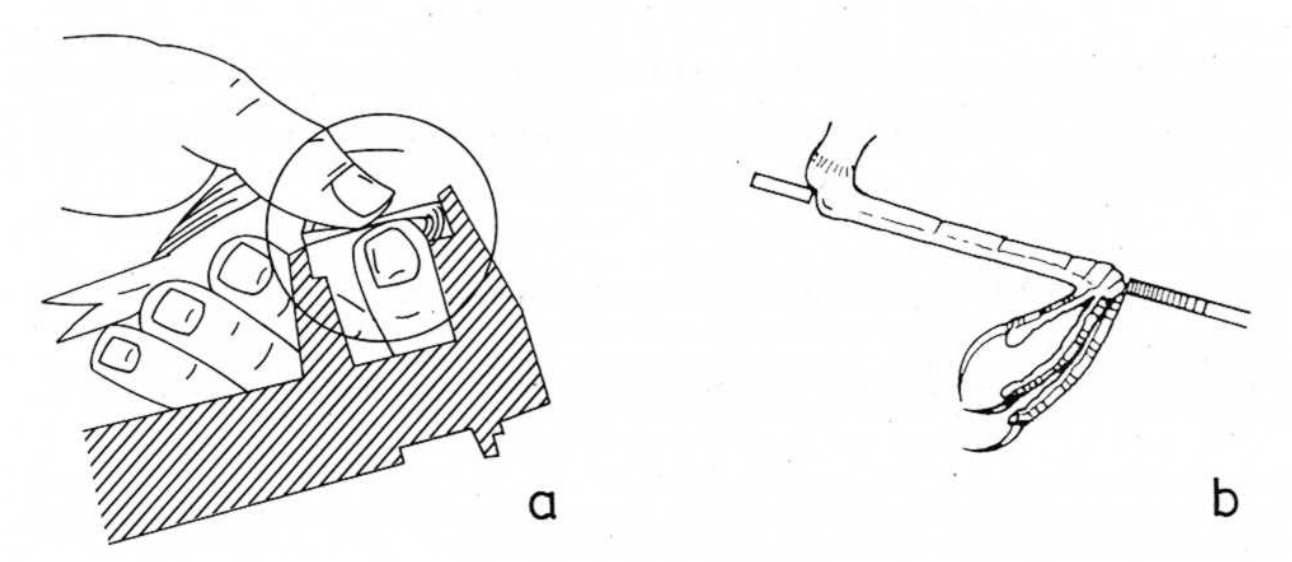


Figure 5: Taking tarsus length. a: Positioning of the tarsus. b: Measuring the tarsus length (Drawings from A. van Noordwijk and after Svensson 1992, Fig. 18B).

Wing-shape (columns 24-53) (Figure 6):
Wing-shape may be related to migration distance, and it may differ between sexes or age classes. For species which can be sexed or aged, recording of the wing shape is highly recommended, although it is very time consuming.
Recording of wing-shape is particularly recommended for the following species:
Willow Warbler, Chiffchaff and *Wood Warbler*, *Blackcap* and *Garden Warbler*, *Redstart* and *Black Redstart*, *Pied Flycatcher, Collared Flycatcher* and *Spotted Flycatcher*.

To measure wing-shape, the length of each individual primary (except the outermost F10) and of the first secondary is measured using the feather-length ruler and the method described above. With the exception of primary 9 (F9, the second outermost) which has to be measured with the pin inserted between F9 and F8, the pin has to be inserted on the "outer" side (distally) of each primary/secondary to be measured (see Figure 6). For wing-shape **read** feather-length **to 0.5 mm**.
It does not matter how the ringer holds the bird and which wing is measured.
For a more detailed description of the method see "feather-length".

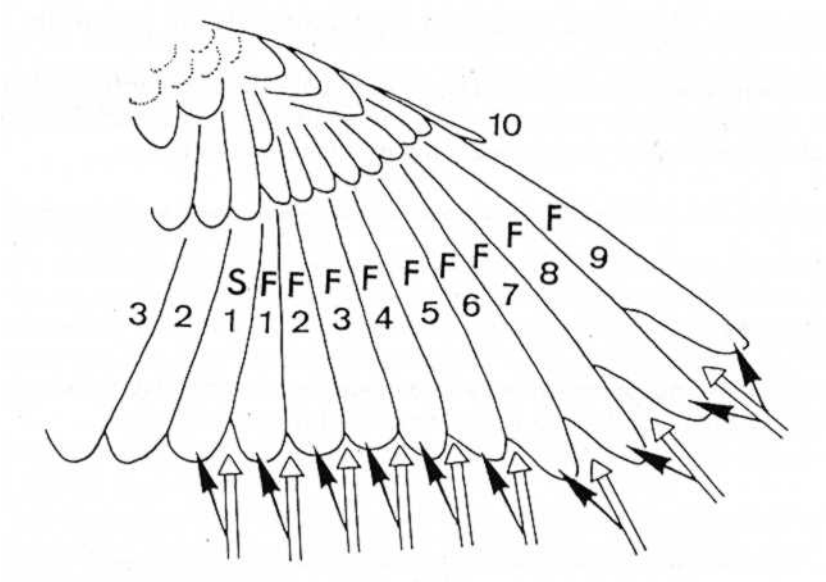


Figure 6: Measuring wing-shape (after Jenni & Winkler 1989, Bird Study 36: 1-15).
Insertion of the pin between the feathers is indicated by the open arrows. The feather measured is shown by the solid arrow.

Moult card (column 54):
Much useful information about moult can be collected as a side-product within this project. For this purpose, fill in the new moult cards (including data on secondaries, tertial, alula and wing-coverts, if possible). However, information for only some of the feathers on the wing (e.g. only primaries and secondaries) is also welcome. Progress in moult research would be most effective, if moult cards are completed for every bird belonging to the following categories (particularly in sub-saharan Africa):

Autumn:
- All adults during or after moult, except those which have the entire plumage renewed and show no growing feather on the wing (including e.g. adult *Ficedula hypoleuca* and *Phylloscopus trochilus* with old secondaries).
- All first year birds with growing or new secondaries or primaries (e.g. *Sylvia undata*, *S. melanocephala*, *Saxicola torquata*) as well as other interesting cases.

Winter/spring:
- All birds in active moult of tertials, rectrices, greater coverts, secondaries or primaries.
- All birds after moult having renewed secondaries or primaries.

Moult cards and further informations may be obtained from Lukas Jenni, Schweizerische Vogelwarte, CH - 6204 Sempach, Switzerland.

If a moult card is completed, please tick in column 51.

Priorities in stressful situations

If necessary, you can reduce the amount of work by following this list of priorities.

1. Omit to record measurements of species other than the target species.
2. Sub-sample randomly the species which is (are) the most numerous daily catches.
   It is important that sub-sampling is randomly distributed. Measure a number of birds each net round (full hour).
3. Omit to record wing-shape.
4. Omit to record tarsus.

The data has to be recorded as accurately as possible.

By adopting a rigorous and standardized approach to data collection, the information gathered will be more valuable for analysis and for accomplishing the goals of the *Network Project*.
All participants are kindly requested to rigorously follow these instructions.

Calibration of measurements

In order to reduce the between-observer variance in measurements and also to test your own repeatability it is highly recommended to do within-site calibrations regularly.

Daily activity record

In order to enable comparisons of the trapping figures between different ESF sites it is highly recommended to record the daily trapping effort and the daily weather circumstances.
Therefore, please fill in the "Daily activity record" schedules every day. To do this you might use the quiet hours of daily trappings, e.g. early afternoon.

Trapping activity:
On days during which the nets are not continuously opened or the funnel traps are not continuously used, please record the hours open for each net.
Please also record the time of the first and last net round.

Exceptional events:
Please record any significant exceptional event, e.g. many persons disturbing trapping, etc. in the 'comments' column, as well as any exceptional weather situation.

Further comments

Recording forms:

You may extend your own forms already in use incorporating the recommended recordings.

Forms to be used may be copied using the enclosed ones, or they can be obtained from Wilhelmshaven.

In order to avoid clutter with forms, it is recommended to use separate sheets for each ring string, as well as for first catches and retraps, respectively.

On the forms used for data recording, the national language at the particular site may be used.
For transfer of the data to the *Network Data Bank*, however, a list has to be prepared including all the translations of the recordings and the species names.

Data transfer to the *Network Data Bank*
If possible, the data gathered should be entered onto the computer by the particular ringing group itself. If you use the recommended forms, please use the recommended columns for data entry (e.g. columns 1-8: ring number, columns 9-14: species code, column 15: first trapping/retrap, etc.).
By entering the data onto the computer by the particular ringing group itself, the rate of errors could be reduced, as it could be done by native speakers, and thus cluttering can be avoided.

If computarization cannot be done by the particular group, the NDB will do it, for which photocopies of the original forms should be submitted.
The data gathered at each site must be transferred to the *Network Data Bank* at Wilhelmshaven soon after closing the season (or even during the course of the season) so that we can derive summary statistics soon after the season closings.
Preferentially, data transfer should be done by providing diskettes (ASCII; highly recommended).

Appendix

Comments on the ageing criteria of the key species

by LUKAS JENNI, LENNART KARLSSON & RAPHAEL WINKLER

These comments on ageing are not a full ageing guide. They indicate which ageing criteria published in Svensson (1992, Identification Guide to European Passerines) and Jenni & Winkler (1994, Moult and Ageing in European Passerines) are best applied. They provide only rough guidelines. The actual criteria have to be looked up in the guides mentioned.

Ringing stations which should have difficulties in obtaining these two ageing guides, should contact the ESF project coordinator.

The following account indicates:
- the **age classes** which are recommended to be determined for this project (age classes in parentheses: a considerable proportion of the individuals cannot be aged or are very difficult to age). However, do not hesitate to record undetermined ages (code 2 in autumn, code 4 in spring), even if ageing is recommended, but also indicate the age of difficult species if you can;
- the **main criteria** for separating the age classes applicable before, during and after each moult.

General comments

Since most **plumage characters** are dependent on the moult cycle of the species, the following account groups the species by moult cycle. Many plumage ageing criteria are based on very slight differences in colour or wear between feather generations. They are best recognized in good light (no direct bright sun), and the use of a watchmaker's lens or a magnifying-glass is recommended.

The examination of **skull pneumatization** (or ossification) is not widely used in Europe as an ageing method, although it is a very convenient ageing criterion in species which are difficult to age on plumage characters. For instance, *Acrocephalus* and *Locustella* warblers pneumatize so slowly that many 1y birds may still be recognizable after their first complete moult in Africa. Hence, the examination of skull pneumatization is strongly recommended (see Jenni & Winkler for details). Below, skull pneumatization is only indicated in species which are difficult to age on other characters, but it may be used for many individuals of the other species which are difficult to age or for which the ringer lacks experience.

Species with a partial postjuvenile/complete postbreeding moult in the breeding range
(including *Luscinia svecica* in which the prebreeding moult does not affect the wing)

Ageing before the postjuvenile and postbreeding moults

The juvenile plumages are generally easily recognized by the structure and coloration of the body-feathers. Adults in summer have worn their plumage for almost a year and usually show distinct signs of abrasion and bleaching.

Ageing during the postjuvenile and postbreeding moults

Birds in active moult of the median coverts, greater coverts and tertials and/or regular, symmetric rectrix moult but without signs of moult of the secondaries and primaries are 1y birds. Birds with growing primaries and/or secondaries following the basic sequence are generally adults.

However, some 1y *Saxicola torquata* and *Phoenicurus ochruros* may moult some inner secondaries and some 1y *Saxicola torquata* some primaries eccentrically.

Ageing after the postjuvenile and postbreeding moults

The following ageing criteria can be applied throughout autumn, winter and spring. In spring and summer, however, some birds may have been exposed to strong abrasion, so that the plumage characters are no more recognizable.

	Age classes	Main criteria for separating the age classes
Luscinia megarhynchos	3/5, 4/6	Moult limit within greater coverts.
Luscinia svecica	3/5, 4/6	Moult limit within greater coverts.
Phoenicurus ochruros	3/5, 4/6	Moult limit within greater coverts or tertials.
Ph. phoenicurus	3/5, 4/6	Moult limit within inner greater coverts. For females, use good light and a watchmaker's lens or, in autumn, skull pneumatization.
Saxicola torquata	3/5, 4/6	Colour of inside of upper mandible in autumn. Moult limits within greater coverts, tertials, secondaries or primaries

Species with a partial postjuvenile/complete postbreeding moult in the breeding range and a partial prebreeding moult in winter/spring

Ageing before the postjuvenile and postbreeding moults

The juvenile plumages are generally easily recognized by the structure and coloration of the body-feathers. Adults in summer have worn their plumage for almost a year and usually show distinct signs of abrasion and bleaching.

Ageing during the postjuvenile and postbreeding moults

Birds in active moult of the median coverts, greater coverts and tertials and/or regular, symmetric rectrix moult but without signs of moult of the secondaries and primaries are generally 1y birds. Birds with growing primaries and/or secondaries following the basic sequence are generally adults.

However, some 1y *Sylvia undata, S. melanocephala* and *S. atricapilla* moult some secondaries and/or some primaries (usually eccentrically), some 1y *Phylloscopus c. collybita* some secondaries, and some 1y *Sylvia melanocephala* perform a complete postjuvenile moult.

Ageing after the postjuvenile and postbreeding moults

The following ageing criteria can only be applied until the beginning of the prebreeding moult whose onset differs between species and area.

	Age classes	Main criteria for separating the age classes
Saxicola rubetra	3, 4	Colour of inside of upper mandible in autumn. Moult limits within marginal, median or greater coverts.
Sylvia undata	3, 4	Colour of orbital ring. Colour of primary coverts.
Sylvia cantillans	3, 4	Skull pneumatization. Moult limits within greater coverts or tertials (most 1y).
Sylvia melanocephala	3, 4	Skull pneumatization. Moult limits within greater coverts, tertials, secondaries, primaries or primary coverts (most 1y). Some 1y moult completely and can only be recognized by skull pneumatization.
Sylvia hortensis	3, 4	Skull pneumatization. Iris colour. Colour pattern of tail feathers. Many adults show arrested secondary moult.
Sylvia curruca	3, 4	Moult limit within (usually outer) greater coverts or alula. Iris colour. Often colour pattern of tail feathers.
Sylvia communis	3, 4	Moult limit within (usually inner) greater coverts (most 1y). Colour of iris. Some adults show arrested secondary or primary moult.
Sylvia atricapilla	3, 4	Skull pneumatization. Moult limits within (usually outer) greater coverts (in about 50% of 1y in central and in 90% of 1y in North Europe) and within tertials or between tertials and secondaries (sometimes difficult to recognize). Shape of tail-feathers often misleading.
Phylloscopus collybita	3, 4	Skull pneumatization. Moult limits within greater coverts (most 1y, but sometimes difficult to detect), within tertials or rectrices or between tertials and secondaries.
Ficedula parva	3, 4	Colour pattern of greater coverts. Moult limit within greater coverts.
Ficedula hypoleuca	3, 4	Colour pattern of greater coverts and central tertial. Moult limit within greater coverts.
Ficedula albicollis	3, 4	as *F. hypoleuca*

Ageing after the prebreeding moult

Adults and 1y/2y of most key species perform a prebreeding moult of considerable extent. Moult limits due to the prebreeding moult occur in both 2y and adults and are not an ageing criterion.Therefore, ageing after the prebreeding moult is difficult in most species and certainly requires some practice. Please indicate the age only if it can be determined by recognized criteria and with a high degree of certainty.

	Age classes	Main criteria for separating the age classes
Saxicola rubetra	(5, 6)	Ageing difficult. Usually, juvenile greater coverts of 2y more bleached than postbreeding greater coverts of adults. The extent of white on inner greater coverts and median coverts is not a good ageing criterion, but is helpful in sexing.
Sylvia undata	(5, 6)	Ageing difficult. Colour of primary coverts. Sometimes colour of orbital ring.
Sylvia cantillans	4	Ageing very difficult. Sometimes, the degree of wear of primaries and primary coverts may indicate the age (more bleached and abraded in 2y than in ad), but many 2y and ad show arrested primary moult.
Sylvia melanocephala	(5, 6)	Ageing difficult. Since the extent of the prebreeding moult is little known, it is not clear whether the autumn criteria are still useful. 2y having performed a complete postjuvenile moult are indistinguishable from adults.
Sylvia hortensis	(5, 6)	Ageing difficult. Iris colour.
Sylvia curruca	4	Ageing very difficult. Criteria which are helpful in combination are: degree of wear of the primary coverts, recognition of juvenile greater coverts, colour pattern of tail feathers.
Sylvia communis	4	Ageing very difficult. Extent of prebreeding moult very variable. Both adults and 2y may show arrested primary moult. Criteria which are helpful in combination are: on average, primary coverts of 2y more worn than in adults; recognition of juvenile greater coverts; colour pattern of tail feathers; iris colour of sexed birds.
Sylvia atricapilla	(5, 6)	Ageing difficult. Many may be aged by the same criteria as in autumn. However, a prebreeding moult including inner greater coverts and tertials has been observed in birds in East Africa and North Europe.
Phylloscopus collybita	(5, 6)	Ageing often difficult. Some 2y show a moult limit within greater coverts due to the postjuvenile moult (beware of prebreeding moult limits, usually distinct). Degree of wear of remiges and coverts.
Ficedula parva	5, 6	Colour pattern of tertials and greater coverts. Colour of chin and throat in males.
Ficedula hypoleuca	5, 6	Colour and wear of those greater coverts not renewed during the prebreeding moult and of primary coverts. Shape of rectrices. Some are difficult to age.
Ficedula albicollis	5, 6	Probably similar as for *F. hypoleuca.* In males, amount of white on primaries and forehead.

Species with a complete moult in the non-breeding area

Ageing before the postjuvenile and postbreeding moults

In many species, the juvenile plumage is not easily recognizable by its colour or structure. However, juveniles have a fresh plumage while that of the adults is usually worn (see below).

Ageing during the postjuvenile and postbreeding moults in the breeding range

Since the postjuvenile and postbreeding moults are usually of very limited extent, the same criteria as before or after these moults apply (exceptions are *Phylloscopus trochilus* and some *Sylvia borin*).

Ageing after the postjuvenile and postbreeding moults in the breeding range and before the complete moults in the winter quarters.

Ageing relies on the difference in wear between 1y and adults. 1y birds have worn their juvenile and postjuvenile feathers for only several weeks or a few months. Adults have worn those feathers not moulted during the postbreeding moult for half a year or more and generally show quite abraded and bleached feathers. Abrasion is especially strong in species living in dense vegetation and reedbeds and most evident on the tertials, tips of the primaries and inner greater coverts.

Since both adults and 1y may perfom a partial moult, both age classes may show moult limits. However, moult limits in adults are much more conspicuous than in 1y birds and can be found more often among tertials and rectrices than in 1y. In some species, some juvenile body-feathers may still be present and are easily recognized (e.g. *Muscicapa striata, Lanius collurio, L. senator*).

These general rules do not apply to *Phylloscopus trochilus* and to the very few *Sylvia borin* which have performed a complete postbreeding moult.

Adult *Acrocephalus palustris* perform a partial moult in autumn/early winter in NE Africa which includes the body-feathers while 1y birds do not show this moult, so it represents an ageing criterion after this partial moult and before the complete moult further south.

	Age classes	Main criteria for separating the age classes
Locustella naevia	3, 4	Difference in wear. Adults may renew tertials and a few start primary or secondary moult in Europe
A. paludicola	3, 4	Difference in wear.
A. schoenobaenus	3, 4	Difference in wear.
A. palustris	3, 4	Difference in wear.
A. scirpaceus	3, 4	Difference in wear. Iris colour.
A. arundinaceus	3, 4	Difference in wear. Some adults may start primary moult in S Europe.
Hippolais pallida	3, 4	Difference in wear.
Hippolais icterina	3, 4	Difference in wear.
Hippolais polyglotta	3, 4	Difference in wear.
Sylvia borin	3, 4	Difference in wear of greater coverts and tertials. Adults may renew tertials. A few adults start primary moult, and a very few perform a complete moult, before autumn migration.
Phylloscopus bonelli	3, 4	Difference in wear. Adults may renew tertials and a few primaries or secondaries before autumn migration.
Phylloscopus sibilatrix	3, 4	Difference in wear. Adults may renew tertials and some renew a few primaries before autumn migration.
Muscicapa striata	3, 4	Difference in wear. Colour pattern of inner greater coverts. Adults may renew tertials and a few renew some primaries or secondaries before autumn migration.
Lanius collurio	3, 4	Difference in wear. Colour pattern of upper parts and wing coverts. Some adults may renew tertials and a few primaries or secondaries before autumn migration.
Lanius senator	3, 4, 5	Difference in wear. Colour of body feathers. Moult suspension.

Ageing during the complete moult in the winter quarters

Provided that old feathers are still present and that abrasion has not been too strong, the age may still be determined. The complete moult of most key species in the winter quarters is not well known. It may be protracted, include the renewal of certain feathers twice during winter, temporarily suspended or incomplete. It is not known whether or not there are differences between adults and 2y regarding these more complicated moult patterns (except in *Lanius senator*, see below). In some species, the age may still be recognized on skull pneumatization, but no data are available at present.

Ageing after the complete moult in the winter quarters

Adults and 2y birds are usually inseparable on plumage characters at this time, but may be separated on iris colour and tongue spots (e.g. *Acrocephalus scirpaceus*). Both age classes may retain some secondaries (e.g. *Oriolus oriolus*). In some species, the age may still be recognized on skull pneumatization, but no data are available at present.

Lanius senator: Adults perform a complete moult and thus have a completely fresh plumage. 2y birds usually retain some innermost primaries, some secondaries and primary coverts. However, some 2y birds have been found to renew all primaries and to retain only one or a few primary coverts. Hence, 2y birds performing a complete moult may occur as well.

Special cases

Phylloscopus trochilus

Ageing after the postjuvenile/postbreeding moult: Colour of underparts. Some adults retain some secondaries.

Ageing after the complete moult in the winter quarters: Not possible on plumage characters.

Locustella luscinioides

Ageing after the postjuvenile/postbreeding moult: 1y birds seem to undergo no or a restricted partial moult before autumn migration. Adults may undergo a complete moult, a partial moult including some remiges or a partial moult including only some body feathers. Therefore, ageing is best done on skull pneumatization, but birds with abraded wing feathers are adults.

Ageing after the moult in the winter quarters: Since the moult in the winter quarters is very variable, no reliable ageing criteria is known at present.

Site: ______________________

level 1 - data

page ______

ring number	Rtype	species	date (d d m m y y)	time (hrs min)	net	age	sex	moult b.f. int	moult b.f. prg	moult pp	feather length (0.5mm)	wing length (0.5mm)	weight (0.1g)	fat	muscle	level 2	ringer initials	comments (malformations, faultbars, etc.)
A B 1 2 3 4 5 6	f	*example*	3 1 1 2 9 4	0 6 0 0	2 2	3	2	1	U	0	4 9 . 5	0 6 7 . 5	0 7 . 8	1	2	x	R I	curved bill
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					
											.	.	.					

Site: ____________________ **level 2 - data** page ______

ring number	species	date						tarsus	wing shape (length of feather ..) (0.5 mm)										moult card	ringer initials
		d	d	m	m	y	y	(0.1 mm)	F9	F8	F7	F6	F5	F4	F3	F2	F1	S1		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		
								.	.	.	.	.	.	.	.	.	.	.		

Habitat recording

Ringing site: ______________________________

Date: __________ Length of net line (m): ______________

side ______ (use compass direction)								net no	net length (m)	side ______ (use compass direction)							
habitat		height	water	fruits			mgmt			habitat		height	water	fruits			mgmt
1	2			pres	type 1	type 2				1	2			pres	type 1	type 2	

Daily activity record

Ringing site: _____

date			sunrise	sunset	nets open	net round		exceptional	other events
d	m	y			time, net number(s)	first	last	weather	e.g. disturbances, comments
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									