North Atlantic Gannet

Observing and recording

Teachers Resource Pack

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Contents

The behaviour of the North Atlantic Gannet - *Sula bassana/Morus bassanus*

Introduction

The new Scottish Seabird Centre in North Berwick has provided an opportunity to study the behaviour of gannets in their natural environment without disturbance to the colony. Micro-cameras relay live pictures to the centre, enabling first hand observations or video recordings to be made of the birds, and students can work without having to brave the elements! From February to November a range of behaviour can be observed, from courtship, nesting and parental care, to preening and territorial behaviour making the gannet an ideal subject for bird studies.

Materials available in the pack

- Background information on the North Atlantic Gannet *Morus bassanus*..
- Suggested methods for gathering and recording data on preening and other behaviour.
- A thirty minute video of gannet behaviour.
- Student instructions for recording observations and analysing results from the videos, from the centre or from live web cams when available.
- Recording sheets.

Aims

The aim of this pack is to:

1. Introduce students to methods of observing and scoring Gannet behaviour.
2. To enable students to identify, describe and analyse behavioural adaptations of the Gannet, e.g. preening; courtship; territorial; nest defence and care of young.

Syllabus links

The study of behaviour is found in several areas of both the English and Scottish curriculum. Materials in the pack can be used for the basis of investigations, recording and observation skills in the Lower Secondary School, within the **5-14 Environmental Studies** curriculum in Scotland. They can provide examples to be used in S3 and S4 **Standard Grade Biology** course in the Animal Survival – Behaviour section, along with usage in the **Advanced Higher Animal Behaviour** option.
They can also be used within the **Advanced Level (AS/A2) Biology and Psychology** courses.
The study can form a basis for further **project** work within the advanced school courses.

Objectives

In carrying out this study of gannet behaviour Lower Secondary students (S1 and S2) should be able to:

- recognise a variety of preening activities of gannets
- accurately observe and record preening durations
- understand the use of continuous sampling methods
- present comparative results as bar graphs or pie charts
- draw conclusions from their observations
- research information about gannets.

In addition to this, pupils in Middle Secondary (S3 + S4) should also be able to:

- recognise different categories of gannet behaviour
- use ethograms to record behaviour
- carry out focal sampling to observe a gannet's behaviour
- record behaviour using instantaneous sampling methods.

In addition to this, pupils in Upper Secondary (S5 + S6) should also be able to:

- carry out a more detailed sequence analysis on preening behaviour
- recognise further behaviour patterns in gannets
- use scan sampling and ad lib. sampling to further their observations
- study the functions of behaviour patterns
- statistically analyse results
- discuss their results relating them to background research
- relate their observations to the biology of breeding behaviour and feather maintenance.

Sampling methods

A gannet's behaviour can be observed using continuous, instantaneous and scan sampling techniques. Several papers are available on these techniques:

- Time Budgets - Advice for A Level Students - Joanne Wilshaw – Feedback, the ASAB education newsletter.
- Advanced Higher Student Monograph – Mike Hansell – 2000 Learning + Teaching Scotland

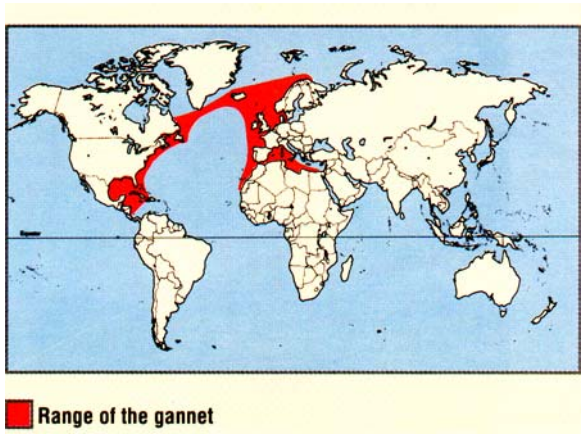
The North Atlantic Gannet – Some facts and figures.

Classification

Kindom	Animalia
Phylum	Chordata – Vertebrata
Class	Aves
Order	Pelecaniformes
Family	Sulidae
Genus	*Sula*
Species	*bassana*

Now reclassified as:

Genus	*Morus*
Species	*bassanus*



Comparison with Blackbird size and breeding

Gannet

Sizes:
Length: 87-100cm
Wingspan: 165-180cm
Weight: 2.4-3.5kg

Blackbird

Sizes:
Length: 25cm
Wingspan: 30cm
Weight: 80-105g

Breeding:
Sexual maturity: 5-6 years.
Breeding season: Early spring to summer.
No. of broods: 1
Eggs: 1, whitish.
Incubation: 44 days.
Fledging period: 90 days.
(N.B. This is unusually long.)

Breeding:
Sexual maturity: 1-2 years.
Breeding season: February until early autumn.
No. of broods: 3
Eggs: 3-5, pale blue green, mottled with reddish-brown.
Incubation: 12-14 days.
Fledging period: 14 days.

More Gannet Facts:

Lifestyle:
Habit: Breeds in colonies; less sociable at other times.
Diet: Mainly fish.
Lifespan: 16-20 years.

Related Species:
The family Sulidae – gannets and boobies- has only nine species all belonging to the genus *Sula*. The gannet's closest relatives are the Cape gannet, *Sula capensis,* and the Australian gannet, *Sula serrator.*

Distribution:
Continental shelf regions of the North Atlantic.
Breeding centres in Britain, Ireland, Norway, Iceland and eastern Canada.

Conservation:
Populations declined sharply in the nineteenth century due to hunting. New protected colonies have developed in the last 100 years around Europe, and the population is increasing.

The Bass Rock – East Lothian

Habitat:
The gannet is primarily a seabird. Its current population of around 200,000 breeding pairs stay mainly in continental waters of the North Atlantic. 70% of the world's gannets breed in the British Isles. With one exception, all the colonies are on offshore islands, such as Grassholm, off Dyfed, Bass Rock in the Firth of Forth and St. Kilda, west of the Outer Hebrides, which hosts the largest colony with around 60,000 pairs. The only mainland site is at Bempton cliffs in Yorkshire.

Background Information

Feeding:

Fish up to 30cm in length make up most of the gannet's diet, although it will also catch squid. Prey species include anchovy, capelin, cod, haddock, herring, mackerel and pilchard all of which are fast swimming, open water fish.

Hunting:

When rearing young the gannet will search for food from 320km up to 600km from the colony. Fishing trips last up to 13 hours and average speeds are between 40-60kph.

It will locate prey from up to 40m above the water and **plunge-dive** to a depth of 15m. Large air sacs around the gannet's throat and neck help to absorb the shock of impact when it dives. It can also close its nostrils when diving. A dive can last from 5 to 20 seconds. This is an unusual behaviour, fishing birds usually spending more time underwater hunting prey – the emperor penguin can submerge for up to 20 minutes in search of prey.

Plunge-diving

Other hunting techniques include plunge-diving from a lower height at an angle, and surface diving after dipping the head underwater to scan for prey. Fish will be caught in a serrated beak and only swallowed when the bird surfaces.

Breeding Behaviour:

During the breeding season the gannets will gather in large colonies on grassy coastal slopes or flat-topped islands. The gannet mates for life and usually uses the same nest site. The close proximity of their nests and the fact that they are extremely aggressive birds has influenced the evolution of a variety of territorial, appeasement, courtship and grooming behaviour patterns. The opening of the Scottish Seabird Centre in North Berwick has enabled close observations of the bird's behaviour on the Bass Rock. The displays are readily recognised and lend themselves to

observations and recordings at a variety of levels. The most common displays are illustrated on Record Sheet 5.

A single egg is laid and about 92% of all hatchlings survive and fledge. The parental feeding ensures large fat stores for the chick for migration and energy before they are able to dive and feed themselves. Between 60 and 70% of fledglings die before they are a year old, however, the long-lived gannet produces enough eggs to result in a stable or slowly increasing population.

The juvenile gannet has unusual black plumage. This is a disadvantage to the young bird when fishing as it is not camouflaged from below, but is thought to prevent conflict with adult birds whilst in the nest.

Outside the breeding season the gannet is more solitary, fishing and roosting at sea. It comes to the coast only in bad weather or to pursue large fish shoals. Some – especially the immature birds – fly south to warmer climates in the winter; Florida to the west of the Atlantic, and Guinea Bissau, off north west Africa. They return to nesting colonies between January and March.

A pair of gannets from the Bass Rock

Preening and oiling:

Preening the feathers with the beak is important to keep them clean but sea birds in particular need to keep feathers oiled to prevent them becoming waterlogged. The bird picks up oil by rubbing its head over the area where the oil gland is located (over the base of the tail) and then rubbing it over the rest of the body.

Gannets – Teacher's Guide to the Record Sheets

- The **Record Sheets and Instructions for Students** provided can be used in conjunction with the tape sequences, live viewing or web cam viewing.
- **Tape sequence A1** (6 minutes) and **A2** (12 minutes) show gannets preening.
- **Tape sequence B** (15 minutes) shows a variety of behaviour, including sky pointing, jabbing, fighting, bowing, threats, etc.

Does the gannet preen one part of it's body more than another?

- **Record Sheets 1, 2 and 3** can be used at the discretion of the teacher depending on ability of student.
- The students should watch a section of **Tape sequence A1** to identify the preening behaviour of the body areas shown on **Record Sheets 1-3**.
- **Tape sequence A2** allows a preening bird to be viewed for 15 minutes.
- Continuous recording should be made over a suggested period of 10 minutes for each chosen bird, followed by a further 10 minutes to compare the duration of preening of different areas.
- Recording should be of seconds spent preening each area as a basis for determining 'which area of the gannet is preened most? (See page 9.)
- Results can be analysed and graphed in a variety of ways, again depending on ability of students.

Is there an order to the preening routine of the gannet?

- Sequence analysis can be recorded using **Record Sheet 4** as a basis for answering the question 'which area is preened after which?' Scan sampling should be used to compare 2 sequential 10 minute periods of preening.
- Some students might wish to record the left and right wings etc. separately, if so **Record Sheet 4b** can be used.
- For a complete sequence, a map can be plotted using the grid provided on **Record Sheet 4a**, drawing arrows between each area preened.
- Comparisons can be made between adult and young birds. Differences could result from learning or simply differences in feather type.

What general behaviour can be observed and how often does it occur?

- A variety of behaviours can be identified using **Tape sequence B**.
- **Record Sheet 5** should be used as a tick sheet for recognising behaviour.
- The sheet could form the basis for answering the question 'how many times do you spot this behaviour over15 minutes?'

- Instantaneous sampling can then be used with the **Record Sheet 6,** using 10 or 15 second time intervals.
- Analysis of results can again lead to a variety of methods of presentation.

Further Observations

- **Tape sequence B** shows parents with well advanced chicks. In addition to preening there are territorial and other interactions between neighbours. This provides a variety of behaviours that can be observed and scored, and questions that can be answered from the data collected. Some suggestions on bowing; threats and jabs; arriving and departing and wing exercising are expanded in the **Instructions for Students** on Page 12.

Instructions for Students

Gannet Preening Activity

Which areas of the body does the gannet spends most tine preening?

Equipment: Stop clock/watch may be useful (a digital clock is displayed on the screen)
Record Sheets 1 or 2 and 3
Tape sequences A1 and A2 – Preening or live gannets or web cam as available.

1. Watch the Tape sequence A1 for 5 minutes to familiarise yourself with the preening activities.

2. Choose a bird to study.

3. Watch your bird on Tape sequence A2 for 10 minutes, recording the time in seconds spent preening each area on the record sheet.

4. You can repeat 3 and 4 with different birds. Adults and chicks can be compared.

5. Find the total length of time spent preening each area for each 10 minutes of observations.

6. Present your results as a bar graph showing the time spent preening each area.

7. You could also present the percentage of time preening each area as a pie chart.

8. Discuss your findings, considering why a particular area is preened most and how often pair preening occurs.

9. If live birds are available to you, or the web cam is in operation you could further this study to compare results at different times of the day.

10. If possible, you could also look at adult and chick preening.

Sequence Analysis

Is there a sequence to the preening activities of a gannet, i.e. do they follow a preening pattern?

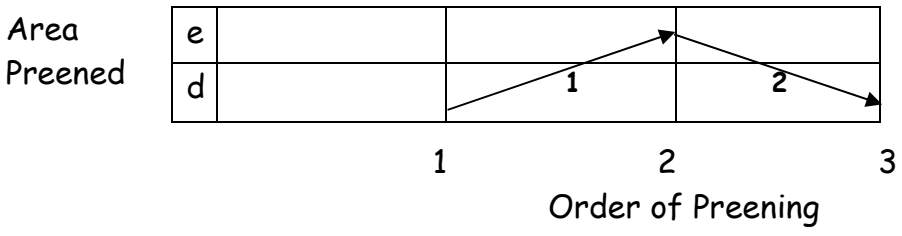
Equipment: Stop clock/watch
Record Sheets 4, 4a and 4b
Tape sequences A1 and A2 – Preening or live gannets or web cam as available.

1. Watch the Tape sequence A1 for 5 minutes to familiarise yourself with the preening activities.

2. Choose a bird to study.

3. Watch your bird in sequence A2 for 10 minutes recording the preening sequence in each area of the body the record sheet. Use **Record Sheet 4** to start with, ticking the box relating to the sequence, for example, if area b is preened after area f put a tick in the corresponding box. If you want to distinguish between right and left sides you can use **Record Sheet 4b.** Both these sheets will let you see which area is preened after which.

4. To record a complete sequence of events you can use **Record Sheet 4a** drawing lines or arrows between the areas, see example below:



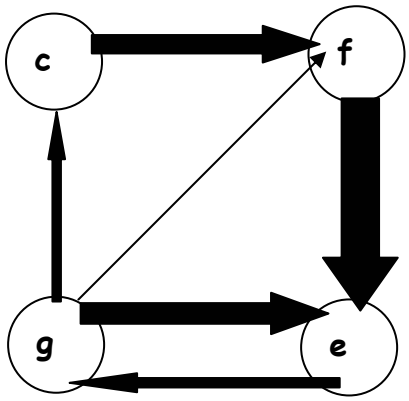
This diagram shows that the chest was preened, followed by contact with the preening gland and then the bird preened its chest again.

5. Repeat for a further 10 minutes with the same bird.

6. You can repeat 3 and 4 with different birds.

7. Present you results graphically – you could also try drawing a flow diagram showing the frequency of sequences.

The width of the arrows could represent different fequencies of the sequencies recorded.



8. If you have completed the preening activity then you can collate your results, looking at time spent on each area along with the sequence. Make sure you use the same section of the video for this.

9. Discuss your results trying to answer some of the following questions:
   Is there a sequence to preening?
   Is this common to all gannets?
   What is the function of the preening gland in your sequence?
   (Do some of your own research into feathers, their maintenance and flight.)

10. If live birds are available to you, or the web cam is in operation, you could further this study to compare results at different times of the day, or look at seasonal variation.

11. If possible, you could contrast adult, juvenile and chick preening sequences. Do you notice any evidence for a change in the pattern over the age groups? Differences could be due to learning or change in feather type.

General Behaviour

What general behaviour of the gannet can be observed? Which behaviour suggests territorial behaviour? Which suggests pair bonding? Does each behaviour have an obvious function?

Equipment: Stop clock/watch
Record Sheets 5 and 6
Tape sequence B –Behaviour or live gannets or web cam as available.

1. Watch the video to try and identify some of the behaviour patterns shown on **Record Sheet 5**.

2. Choose a group of birds to observe.

3. Play the video for 10 minutes and record the number of times you see each activity over the period.

4. Replay the video, this time using **Record Sheet 6** for instantaneous sampling observations. Choose one bird for this and record its activity every 10 or 15 seconds, on the sheet. (You will need 3 recording sheets for this exercise.)

5. Repeat 4 for several other birds to achieve comparative records over the observational period.

6. Present your results as bar graphs or pie charts showing the frequency or percentage time spent on each activity.

7. Daily or seasonal activities can be compared depending on the availability of the birds. If possible, you could compare birds from a densely populated area of the Bass Rock to a less dense area.

8. If possible you could extend your study to relate a particular behaviour to a function.
   a) **Bowing** is the most obvious territorial behaviour but how can you demonstrate that is its function? It consists of 3 or 4 bows interspersed by brief wagging of the head. Is it directed at neighbours? Do neighbours bow in response? Do chicks show it? Try to recognise differences between head wagging (occurs in bowing) and head shaking to clean the beak (occurs during preening).

b) **Threats and jabs** – are these directed at neighbours? What do neighbours do in reply? Are they directed at chicks or shown by chicks?

c) **Arriving and departing** occurs occasionally on the tape sequences. Watch the behaviour between pair members. When does seaweed carrying occur? When does bill fencing and sky pointing occur? Do any of these occur between neighbours? Do chicks ever show these patterns?

d) **Wing exercising.** If exercising is the function of this behaviour it should only be seen in chicks. Is this true?

9. Discuss your results, relating activity to the density of the colony, the age of the birds, the time of day and the season of the year.

The Scottish Seabird Centre

Scotland is world famous for its rich seabird life, with its 10,000kms of coastline being home to a vast variety of fascinating wildlife. Every year over 150,000 seabirds return to the islands off North Berwick. More than 80,000 North Atlantic Gannets cram onto the Bass Rock during the breeding season.

At the Scottish Seabird Centre, North Berwick, you can control remote cameras, sited on the Bass Rock and Fidra to explore the fascinating world of these amazing creatures, without disturbing them. The interactive cameras can zoom, pan and rotate to obtain the best views of the birds on their nesting sites.

Contact the centre for party bookings and discounts.

For more information contact The Scottish Seabird Centre, The Harbour, North Berwick, EH39 4SS
Tel: 01620 890202, Fax: 01620 890222

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World Wide Web

Search engines can bring up numerous sites with no biological relevance. The best ones are the encyclopaedias, which do contain relevant links.

http://www.britannica.com/ - a search for gannets will give you the encyclopaedia entry, web links to the Canadian Wildlife Service and periodical articles. A search for bird behaviour also has interesting material.

http://encarta.msn.com - a search for gannets will link to multimedia sites including www.enature.com - which is worth a visit. Encarta also has encyclopaedia entries and an electronic library; another useful way to gain information from newspapers and magazines websites.

Useful addresses

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Lastly my family; Katie for her helpful suggestions and corrections; Jamie for helping with all my computer problems and teaching me how to use 'PageMaker'.

Record Sheet 1

Gannet Preening

Head

Neck

Back

Chest

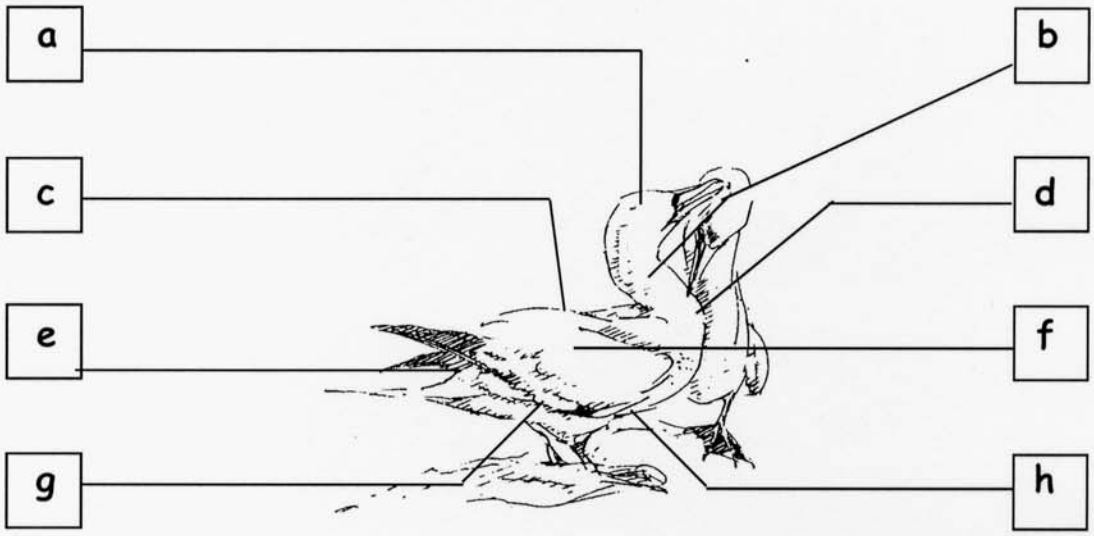
Preening gland

Body under the wing

Wing

Record Sheet 2

Gannet Preening

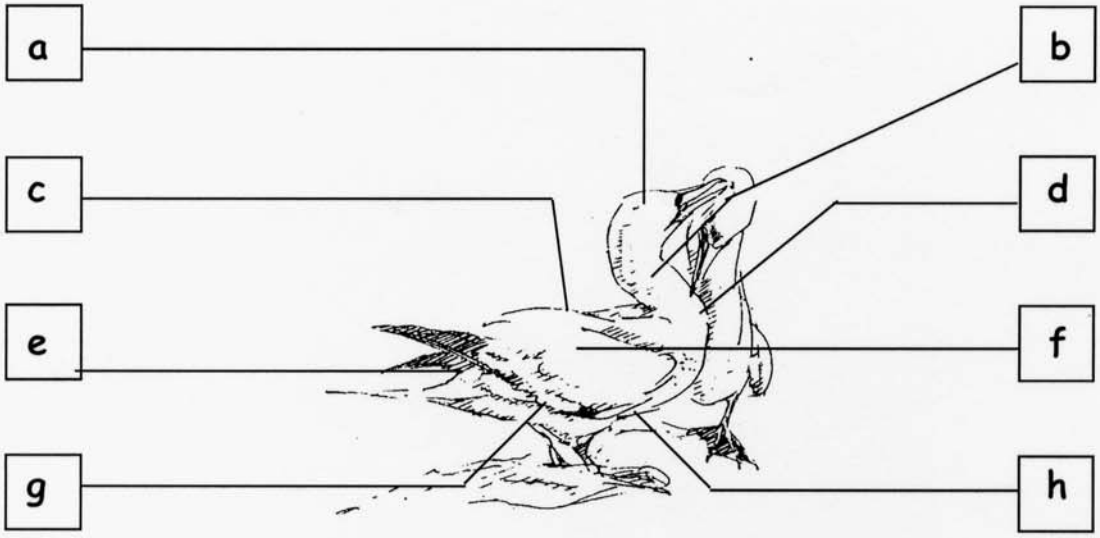


Pair Preening

Area	Time blocks	Total time
a head		
b neck		
Other		

Record Sheet 3

Gannet Preening

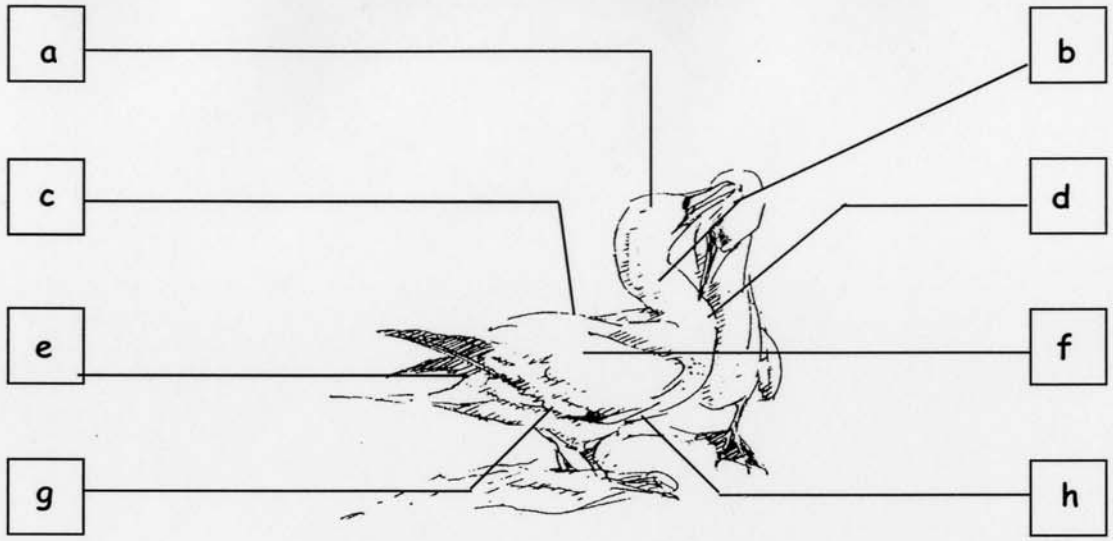


Self Preening

Area	Time blocks	Total time
c back		
d chest		
e preening gland		
f top of wing		
g under wing		
h body under wing		

Record Sheet 4

Sequence Analysis



Area preened after

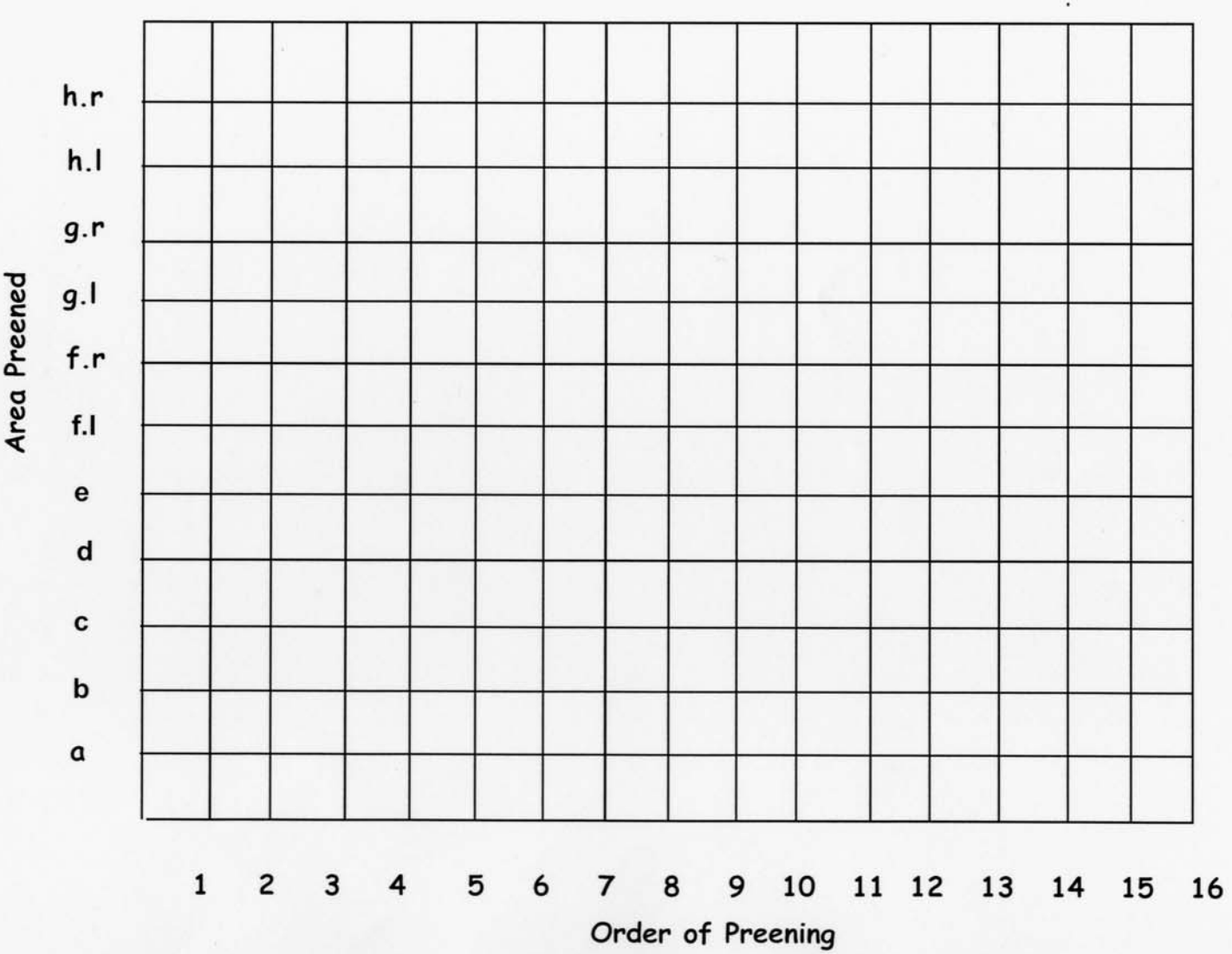
Area preened first	a	b	c	d	e	f	g	h
a								
b								
c								
d								
e								
f								
g								
h								

Record Sheet 4a

Total Sequence Analysis

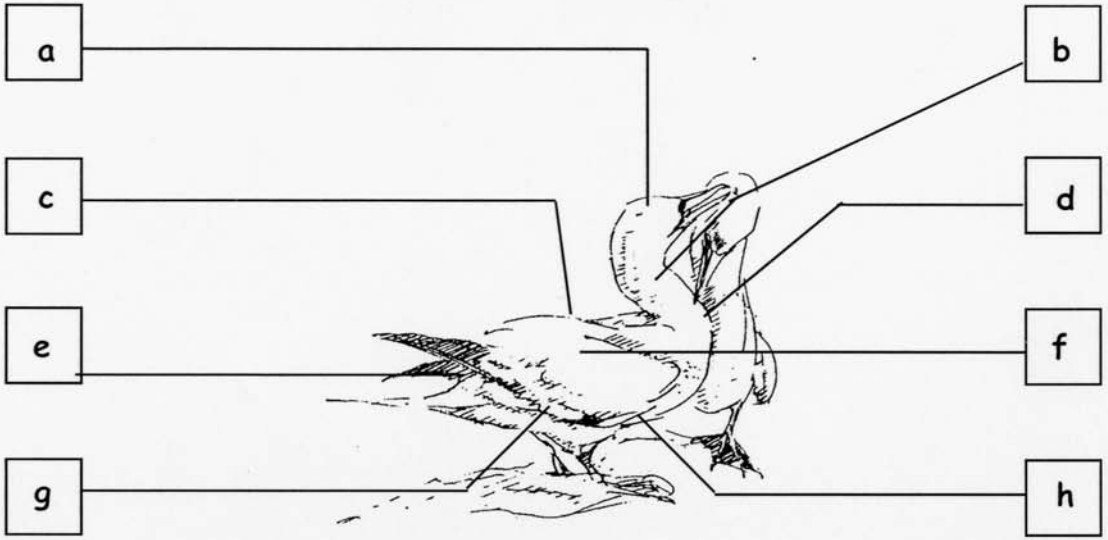
Area Preened

a head
b neck
c back
d chest
e preening gland
f top of wing
g under wing
h body under wing



Record Sheet 4b

Sequence Analysis



Area preened after

Area preened first	a	b	c	d	e	f l	f r	g l	g r	h l	h r
a											
b											
c											
d											
e											
f l											
f r											
g l											
g r											
h l											
h r											

Record Sheet 5

Behaviour Patterns in Gannets

		Number of observations	Total
	Alert posture		
	Sky pointing		
	Bringing seaweed		
	Bowing		
	Preening		
	Threat		
	Fighting		
	Jabbing		
	Nape biting		
	Wing exercising		
	Mutual fencing (greeting)		

Record Sheet 6

Instantaneous Sampling

Time Interval

viour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Alert posture																								
Sky pointing																								
Bringing seaweed																								
Bowing																								
Preening																								
Threat																								
Fighting																								
Jabbing																								
Nape biting																								
Exercising wings																								
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