

Cambridge University Press

978-0-521-29906-0 - Biology of Behaviour: Mechanisms, Functions and Applications

Donald M. Broom

Frontmatter

[More information](#)

---

## Biology of behaviour

Cambridge University Press

978-0-521-29906-0 - Biology of Behaviour: Mechanisms, Functions and Applications

Donald M. Broom

Frontmatter

[More information](#)

# Biology of behaviour

*Mechanisms, functions and applications*

**DONALD M. BROOM**

*Senior Lecturer in Zoology, University of Reading*

WITH ANIMAL DRAWINGS BY ROBERT GILLMOR

**CAMBRIDGE UNIVERSITY PRESS**

*Cambridge*

*London New York New Rochelle*

*Melbourne Sydney*

Cambridge University Press

978-0-521-29906-0 - Biology of Behaviour: Mechanisms, Functions and Applications

Donald M. Broom

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press

The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

[www.cambridge.org](http://www.cambridge.org)

Information on this title: [www.cambridge.org/9780521299060](http://www.cambridge.org/9780521299060)

© Cambridge University Press 1981

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 1981

Re-issued in this digitally printed version 2009

*A catalogue record for this publication is available from the British Library*

ISBN 978-0-521-23316-3 hardback

ISBN 978-0-521-29906-0 paperback

## Contents

<i>The behaviour of farm animals and pests</i>	vii	Sound production by crickets	67
<i>Preface</i>	ix	Other examples of action patterns	71
<b>1 Introduction</b>	<b>1</b>	Sensory-motor co-ordination	75
Questions about behaviour	1	<b>4 The allocation of resources</b>	<b>79</b>
General themes	3	Assessing biological priorities	80
Optimality and fitness	8	Causal factor space	82
Behavioural diversity and reproductive strategies	12	Motivation terminology	85
The universality of environmental effects on behaviour	13	The assessment of motivational state	89
Behaviour development	17	Describing behaviour sequences	91
Rhythms of activity	21	Mechanisms for switching from one behaviour to another	92
Economic and social aspects of behaviour study	21	Stereotypes	98
<b>2 Sensory function: behavioural and physiological evidence</b>	<b>23</b>	The control of rhythms	100
Principles of receptor function	23	<b>5 Body regulation, maintenance and hazard avoidance behaviour</b>	<b>103</b>
Behavioural studies and sensory function	31	Obtaining oxygen	103
Behavioural evidence for sensory analysers	33	Regulating body-water levels	104
Visual pattern recognition: the toad as an example	42	Thermoregulation	108
Visual pattern recognition mechanisms in mammals	48	Body surface maintenance	113
Effects of experience on visual analysis	53	Resting and sleeping	115
Centrifugal effects on sensory function	55	Avoiding physical and chemical hazards	117
<b>3 The control of movement</b>	<b>56</b>	Overload, pain and stress	120
How do mice groom?	56	<b>6 Feeding</b>	<b>124</b>
Other grooming and preening studies	59	Decisions, diets and the optimality approach	124
General ideas about action patterns	62	Finding food	128
Escape swimming by <i>Tritonia</i>	64	Eating: energy, nutrients and dangers	138
		The control of food intake	143
		Feeding by hummingbirds	147
		Grazing by cattle	150
		<b>7 Anti-predator behaviour</b>	<b>157</b>
		Defensive mechanisms and their evolution	157
		Defence behaviour before predator detection	158
		Defence behaviour after predator detection	162
		Exploration and fear responses	168
		<b>8 Functions of social behaviour and dispersal</b>	<b>176</b>
		Modifying the local environment	178
		Food finding and acquisition	179
		Avoiding capture by predators	183
		Improving mate-finding and breeding success	188
		The evolution of social behaviour	191

*Contents*

Territories and home ranges	195
Migration and other types of dispersal	201
<b>9 Reproductive behaviour, including parent–offspring interactions</b>	<b>202</b>
Sexual reproduction and mating systems	202
Behaviour leading to mating	205
The control of courtship and mating	217
Parent–offspring interactions	222
Promoting reproductive success in farm animals	233
Restricting reproduction in pests	237
<b>10 The organisation of social groups</b>	<b>239</b>
The description of social groups	239
The size and composition of social groups	242
Leaders, initiators and controllers	248
Competition within social groups	249
The development of social skills	256
The effects of crowding	258
The significance of social organisation studies for animal husbandry	259
<i>References</i>	263
<i>Author Index</i>	305
<i>Subject Index</i>	311

## The behaviour of farm animals and pests

*Page numbers refer to the beginning of relevant sections*

### FARM ANIMALS

- Ch.1 Farmers and veterinarians as observers; why study farm animal behavior 22
- 2 Odours, sounds etc. eliciting pig sexual behaviour 41
- 5 Drinking by cattle 105  
Temperature regulation by pigs, sheep, cattle, chicks 109  
Grooming by cattle 113  
Sleep in cattle 116  
Stress induced by transport, cold or confinement 122
- 6 Meal size in cattle and fowl 144  
Cattle grazing 150
- 7 Defensive responses by farm animals to man 174  
behaviour in relation to that of stockmen 174
- 9 Cow-calf interactions 226  
Promoting reproductive success in farm animals 233  
mating – oestrus detection, sex ratio, experience effects 234  
parental behaviour and the requirements of young – parturition, obtaining colostrum, maternal recognition of young 236
- 10 Leadership etc. in sheep, cattle, pigs 248  
Peck orders etc. in fowl, sheep, pigs, cattle 252  
Effects of contests on adrenal function in fowl 255  
Group size effects in fowl 258

The significance of social organisation studies for animal husbandry 259  
feral fowl and sheep 260  
the consequences of social orders, competition etc., various species 260  
effects of rearing conditions and inter-group transfer, cattle 261  
group size and density, fowl, pigs, cattle 262

### PESTS

- 1 Why study pest species 22
- 2 Sensory recognition mechanisms: cabbage butterflies, corn-borer, cabbage-root fly, boll weevil 39
- 5 Insect repellents: mosquito, clothes moth 118  
Responses of insects to insecticides: mosquito, stored product beetles, white fly 119
- 6 Host-finding behaviour: ticks, various parasites 130  
Responses to poisons: locusts, rats 140  
Experience and diet: tobacco hornworm 141  
Responses to systemic insecticides 142
- 9 Restricting reproduction in pests, reproduction and sex attractants: various moths, flies, weevils, etc. 237

## Preface

It is now apparent that detailed studies of behaviour are important in many areas of physiology, psychology, zoology and agriculture. In this book I have attempted to draw together the results of observational studies of behaviour and evidence from the work of those who study ecology, evolution, sociobiology, sensory and motor physiology, physiological psychology, motivation and learning. Wherever possible I have referred to examples of behaviour studies which are relevant to agricultural and medical problems, especially farm animal husbandry and pest control, and I have listed on the previous pages the sections where examples are to be found.

Some of the exciting, current ideas about behaviour are introduced in Chapter 1. Major developments include the links between physiological and behavioural studies of both sensory functioning and motor control mechanisms. The central importance, to all those who study behaviour, of work on motivation is emphasised in the chapter on the allocation of resources. Other chapters which refer to many recent ideas are those concerned with the functions of social behaviour and with the organisation of social groups. Themes which recur in each chapter are the evolution of behaviour, the role of learning and other effects of experience, the changes in behaviour which occur during development, the relevant brain mechanisms and economic applications of such studies.

I am most grateful to the following, each of whom was kind enough to read and criticise a chapter of the book: Jack Albright, Stuart Altmann, John Archer, George Barlow, Patrick Bateson, Hilary Box, Robert Drewett, Robert Elwood, Jörg-Peter Ewert, John Fentress, Robert Forrester, Jack Hailman, Toshitaka Hidaka, Robert Hinde, Jerry Hogan, Alick Jones, John Lazarus, David McFarland, Martin Potter, Francis Pring-Mill, Gillian Thompson, Larry Wolf, and Amotz Zahavi. In addition, I thank my wife Sally who read and commented on the whole book, the staff at Cambridge University Press for many helpful suggestions, people who gave me photographs, and Robert Gillmor for his excellent drawings.

Donald Broom