

THE
DRY-FLY FISHERMAN'S
ENTOMOLOGY

MARTIN E. MOSELY, F. E. S.

UC-NRLF



\$B 264 240

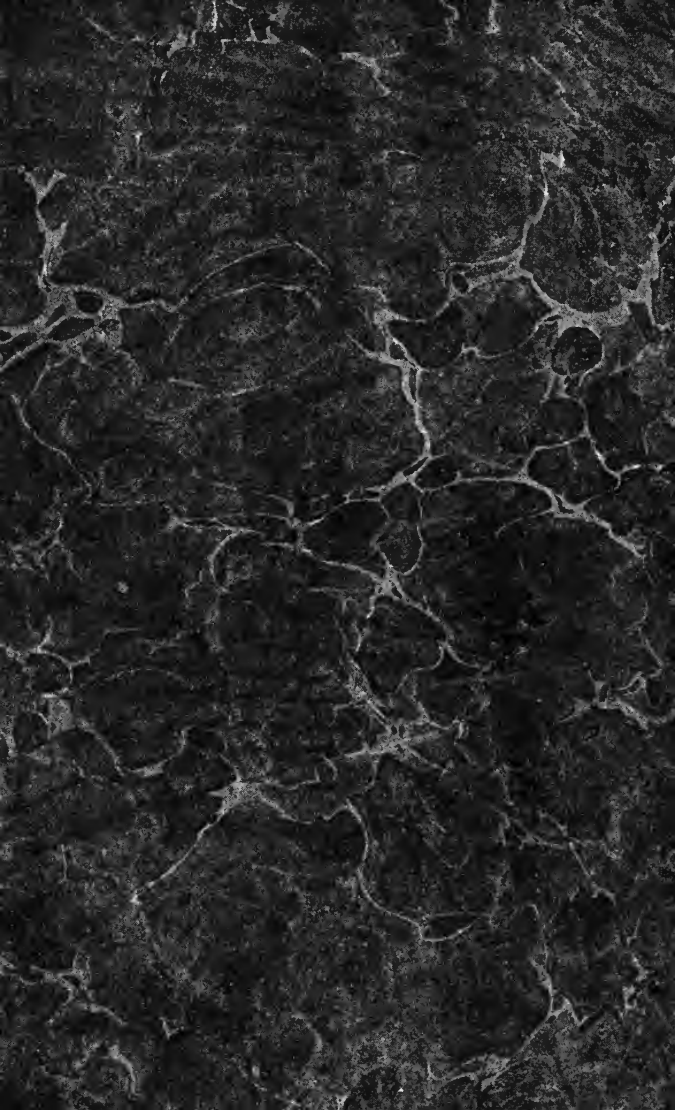
GENERAL
LIBRARY

UNIVERSITY OF
CALIFORNIA

Ex
libris



Don Horter



Fishing



**THE DRY-FLY FISHERMAN'S
ENTOMOLOGY**

The Publishers regret that hitherto they have been unable to find an artist capable and willing to undertake the hand-colouring of the flies figured in this book in such perfection as to meet the standard of meticulous accuracy required by the author for the "AUTHOR'S EDITION." It was originally intended that this should have been published simultaneously with the present hand-coloured edition, and it is hoped that it may still be possible to issue the "AUTHOR'S EDITION" later on.





This is a photograph by A. A. West, 1890.

"Detached Budget" at Work.

THE
DRY-FLY FISHERMAN'S
ENTOMOLOGY

BY
MARTIN E. MOSELY, F.E.S.

BEING A SUPPLEMENT TO
FREDERIC M. HALFORD'S
THE DRY-FLY MAN'S HANDBOOK

LONDON
GEORGE ROUTLEDGE AND SONS, LIMITED
NEW YORK: E. P. DUTTON & CO.

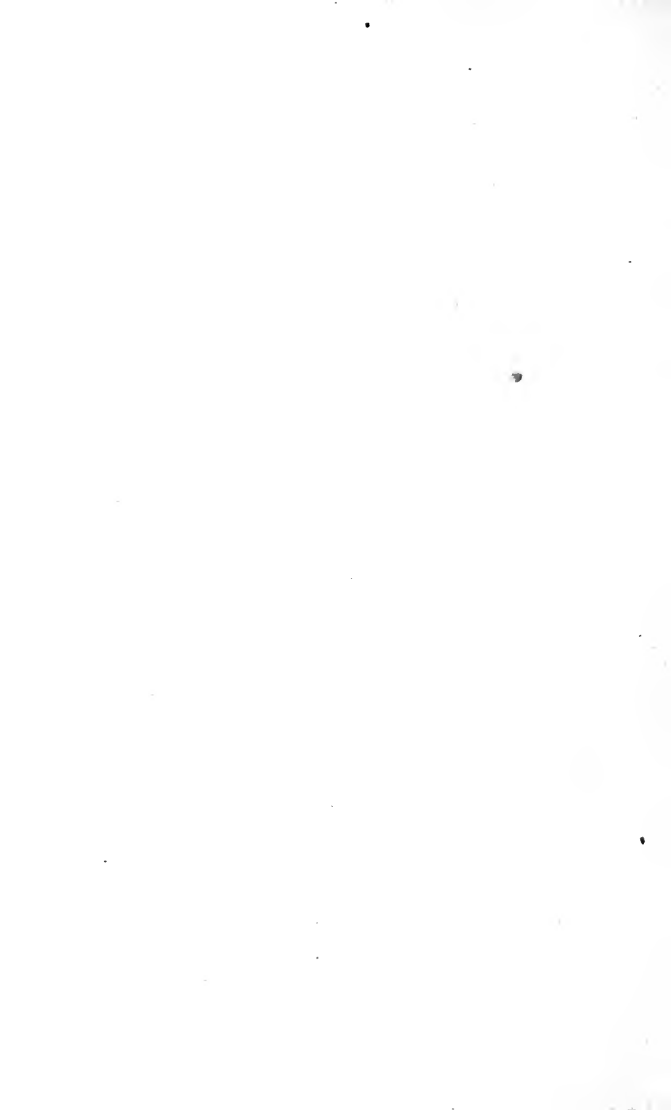
1921

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

SH451
MG

DEDICATED TO THE MEMORY
OF
THE LATE FREDERIC M. HALFORD

M842051



PREFACE

The Introduction to this book was written in the year 1913. An explanation therefore becomes due, setting forth the reasons for so long a delay in its publication. Perhaps the chief cause has been the difficulty of finding an artist with sufficient technical skill who could and would undertake a task of such difficulty as the hand-colouring of the large number of coloured figures shown on the seventeen plates.

The Author was particularly fortunate in securing the services of Mr. Banfield, who spared no pains in painting the original models from which the figures have been copied. Then the European war intervened, and Mr. Banfield proceeded on service before the task had been completed.

Other delays arose by reason of the War : still more, again, by reason of the Peace. In these strenuous times, the difficulty of finding colourists willing to devote the time required for copying the minute details shown on the plates has become more and more accentuated.

Meanwhile, in March 1914, Frederic M. Halford died, and the Author was deprived of the immense advantage of his experience and

counsel in the later stages of the work, though the text had been read and approved by him before the journey to Tunis which ended in his death.

Now that the book is about to be published, the Author feels that the result falls short of the standard he had set up. On the other hand, the cost of production has far exceeded all pre-conceived ideas.

He ventures, nevertheless, to hope that the little handbook may be of assistance to the angler-entomologist along the thorny paths through which his feet must tread, and, in spite of its high cost, may find some corner on the bookshelves of the collector of angling literature.

MARTIN E. MOSELY.

1920.

TELEPHONE
RADDINGTON 4297.

6 PEMBRIDGE PLACE.

W.

November 12th 1913

My dear Martin

Soon after the appearance of
"The Dry Fly Man's Handbook" the Prince
Pierre d'Ahrenburg writing to Mr. G.
J. Sheinphaus (the Angling Editor of The Field)
suggested that it would be a material help
to earnest students of dry fly fishing, when at-
tempting to identify insects seen by them, to
have a ready means of reference to coloured
illustrations of the most usual species present
on or near the trout & streams -

I cannot at my advanced age undertake
the laborious task of not ^{only} describing but
also supervising & in many instances correcting
the drawing & colouration of the fly plates
Your assistance in working out the details

of the entomological portion of my last book was simply invaluable & I am under deep obligations to you for your most efficient co-operation in that most difficult branch of the subject.

I am of opinion that you are the right man in the right place when you confer the further favour on me of writing & editing this Pocket Edition -

As I wish it to be clearly understood by our brother anglers that you are taking on your shoulders this heavy & responsible work at my urgent request I think it due both to them & to you that this letter should appear as a sequel to the Introductory

* rejoice

Chapter of your book. Its success I
think is fully assured & no one will
rejoice at its cordial reception of the
anyling public more than myself

Believe me

My dear Martin

Yours very sincerely
Frederic. M. Galford

Martin E. Mosely Esq
21 Alexandra Court
Queens Gate
S.W.

INTRODUCTION

DURING the past few years suggestions have been thrown out from time to time, and from various sources, that a series of plates, or perhaps a book, based on modern scientific ideas, and illustrating in colour the insects which are of main importance to the dry-fly fisherman, would not only be of assistance to him by the river-side, but might also prove a valuable supplement to the great and immortal works of Mr. F. M. Halford on dry-fly fishing and its entomology.

Shortly after the publication of the French translation of the "Dry-Fly Man's Handbook," Mr. Hugh T. Sheringham, the popular angling-editor of the "Field," was deputed by some well-known French fly-fishermen to approach Mr. Halford and endeavour to persuade him to issue a supplement to his latest work, giving in colour the insects mentioned in his entomological chapters.

A previous suggestion had been made by Mr. J. Sefton-Sewill that a set of plates of a size convenient for the pocket, showing in colour the prototypes of the thirty-three patterns of dry-flies appearing in the "Modern Development of

the Dry Fly," would be welcomed by all dry-fly men as a valuable, if not indispensable, item in their sporting outfit.

This book is the direct outcome of these suggestions, and my apology to the angling public for its authorship must be the letter from Mr. Halford, published at his request, in this Introduction.

Although I have been glad to undertake so congenial a task, yet it is with some diffidence that I have taken up the burden which the "master" himself has laid down.

While embodying Mr. Sefton-Sewill's suggestion as to the pocket size, I have somewhat enlarged upon the original idea, and have endeavoured, to the best of my ability, to produce a work which, in spite of its limitations, may assist the angler in correctly determining some, at any rate, of the many insects he will find during the pursuit of his favourite pastime.

I am at once confronted with the difficulty of deciding, out of the vast array of insect life with which the fly-fisherman has to deal, what to include and what to omit. Writers on the fisherman's entomology have usually confined their descriptions to the flies which they believed to be more readily taken by the feeding fish. As a consequence, it not infrequently happens that an insect present in great abundance by most trout streams, meets with but scant notice, and thus the fisherman, left to his own resources, may have to determine its identity from insufficient data. Possibly he

may be driven to the old and not exactly scientific method of catching his fly and endeavouring to match it from the nondescript medley of patterns reposing in his fly-box. The next stage is to apply to the living insect the name of the composition of fur, quill, and feathers which it most nearly resembles, and hence we get the confusion which exists in the fishermen's nomenclature, and the indiscriminate application of the names of trout-fly patterns to the actual insect. Hence comes the historical hatch of wickham's fancy, the mystic blue dun which, like the sea-serpent, is frequently reported but never brought to land. Hence comes the never-ending controversy which engulfs the unfortunate welshman's button, the continual confusing of the yellow sally with the yellow may dun, the uncertainty as to the identity of the february red and the early brown. Many other stumbling-blocks to the unlearned in these matters arise from this unmethodical practice.

I am therefore inclined to regard such a task as this with the eye of the entomologist rather than that of the fly-fisherman; and throwing aside such considerations as whether this fly is acceptable to the trout, whether that fly has a bitter taste and is allowed to float away unnoticed, I have attempted to describe the flies which I myself have found in plenty, and which I think my brother anglers will also meet with by the river's bank.

The second difficulty arises by reason of the

great preponderance of species of the TRICHOPTERA or caddis-flies over those of the EPHEMERIDÆ (by which name are known the duns and spinners) and the PERLIDÆ or stone-flies; these are the chief families with which the dry-fly fisherman need concern himself. There are at least 179 described British TRICHOPTERA, whilst the number of species of both the remaining families combined, in so far as these islands are concerned, is but seventy or so.

The angler will meet with so many different species of caddis-flies, that I am tempted to devote more space to this branch of the subject than the actual necessities of the fly-tyer would seem to warrant. As Mr. Halford strongly urges, for all practical purposes the artificial patterns for this family, with the exception perhaps of the welshman's button and the grannom, may be limited, without disadvantage to the fisherman, to the three representative types which form part of the series of the thirty-three patterns.

Coloured drawings of the TRICHOPTERA, though helpful, are perhaps not quite so useful to the student as outline drawings of palpi, genitalia, and other important parts, and therefore for the benefit of the angler who would delve more deeply into a subject full of interest, in many instances supplementary figures of these parts, drawn under the microscope, have been given.

It has been intended that this book should form merely a supplement to the entomological chapters of the "Dry-Fly Man's Hand-

book," and I therefore assume that my readers have already made themselves conversant with that work. I would ask them to read with some care Mr. Halford's opening remarks on entomology, found on pages 213 to 227 of the Handbook, as an elementary knowledge of the subject will be found necessary in order to follow the descriptions accompanying the plates in this book, and only a few lines have been written here on the general principles of entomology.

The publication of this work, following so closely along the lines of Mr. Halford's standard books on the dry-fly, is bound to give rise to occasions for comparison of these coloured representations of the living flies with the colours of his thirty-three patterns. Possibly discrepancies may be pointed out between them. In anticipation of such criticism, I must ask my readers to bear in mind that Mr. Halford's patterns are based on the colours as seen from the ventral side only of the insects, whereas in this work the duns are shown mainly in profile, and the spinners arranged with the dorsal side uppermost.

I will not detain the reader any longer, but in conclusion must acknowledge my indebtedness to Mr. Halford for the great help he has rendered in the production of this book, not only with his friendly counsel, but also in the laborious task of proof-reading¹ and correction; to Mr.

¹ On the death of Mr. Halford, after this manuscript was set up in type, Mr. William Senior and the Rev. A. E. Eaton most kindly undertook the task of reading through the proofs. Their criticism and advice were invaluable, and I owe to both these gentlemen my most grateful thanks.

Kenneth J. Morton, who has devoted years of a busy life to the study of many Orders and Families with which the trout fisherman has to deal, and who has never grudged the time spent in replying to my many letters, nor the careful attention required for the identification of such insects as I have sent him, and who has furthermore added to his many kindnesses by carefully examining and, where necessary, correcting all the drawings of genitalia appearing in these pages; to the Rev. A. E. Eaton, who is *the* authority the world over on the EPHEMERIDÆ, and whose ready help has been as invaluable to me as it was to Mr. Halford in bygone days; to Mr. Hugh T. Sheringham, who at once acceded to my request to devote some of his busy hours to the reading of my MS.; and, finally, to those members of the angling public who have so readily responded to my frequent requests, published in the angling press, for insects which frequent streams with which I am unacquainted.

MARTIN E. MOSELY.

21 ALEXANDRA COURT,
QUEEN'S GATE, S.W.

CONTENTS

| | PAGE |
|--|------------------------|
| DEDICATION | v |
| PREFACE | vii |
| INTRODUCTION | ix |
| INTRODUCTORY LETTER FROM THE LATE FRED- ERIC M. HALFORD | between pp. xiv and xv |
| LIST OF PLATES | xvii |
| LIST OF ILLUSTRATIONS | xix |

PART I

| | |
|--|----|
| CHAPTER I.—THE COLLECTION AND PRESERVA- TION OF WATER INSECTS | 1 |
| CHAPTER II.—THE DETERMINATION OF GENERA AND SPECIES | 7 |
| CHAPTER III.—CLASSIFICATION OF THE TRICH- OPTERA | 16 |

PART II

| | |
|--------------------------|----|
| THE EPHEMERIDÆ | 22 |
|--------------------------|----|

PART III

| | |
|---------------------------|----|
| THE TRICHOPTERA | 40 |
|---------------------------|----|

PART IV

| | PAGE |
|--------------------------|------|
| THE PERLIDÆ, &c. | 70 |

PART V

| | |
|--|-----|
| LISTS OF DESCRIBED BRITISH EPHEMERIDÆ, TRICHOPTERA, AND PERLIDÆ | 82 |
| INDEX | 105 |

LIST OF PLATES

| PLATE | FACING PAGE |
|---|---------------------|
| "DETACHED BADGER" AT WORK | <i>Frontispiece</i> |
| 1. THE MAY-FLY. Nymph, sub-imago, male ; imago, female | 24 |
| 2. BAËTIS SPECIES. Olive dun, male ; dark olive dun, male. Olive spinner, female, spent ; olive spinner, female ; olive spinner, male | 28 |
| 3. PALE WATERY DUNS AND SPINNERS. Pale watery dun, male ; Pale watery spinner, female ; Pale watery spinner, male. Eyes of <i>Baëtis binoculatus</i> , <i>B. scambus</i> , <i>Centroptilum</i> <i>luteolum</i> , and <i>C. pennulatum</i> , male spinners | 30 |
| 4. IRON-BLUE AND CÆNIS. Iron-blue dun, male ; iron-blue spinner, female ; iron- blue spinner, male (jenny spinner). <i>Cænis</i> <i>halterata</i> , imago, female | 32 |
| 5. EPHEMERELLA IGNITA. Blue-winged olive, male ; sherry spinner, male ; sherry spinner, female, in flight ; sherry spinner, female | 34 |
| 6. ECDYURUS AND HEPTAGENIA. March brown, nymph ; march brown, female ; march brown spinner, male (the great red spinner). Yellow may dun, male ; yellow may spinner, female | 36 |
| 7. LEPTOPHLEBIA SPECIES. Turkey brown, female ; turkey brown spinner, male ; turkey brown spinner, female. Claret dun, female | 38 |
| 8. LARGE RED SEDGE. <i>Phryganea striata</i> , female ; <i>Phryganea grandis</i> , male | 40 |

| PLATE | FACING PAGE |
|---|-------------|
| 9. CADDIS FLIES, LIMNOPHILIDÆ. <i>Limnophilus lunatus</i> , caddis case; <i>Limnophilus flavicornis</i> , caddis case; <i>Limnophilus lunatus</i> , female (the cinnamon sedge); <i>Halesus radiatus</i> , female (the caperer); <i>Chætopteryx villosa</i> , female; <i>Anabolia nervosa</i> , male; <i>Stenophylax stellatus</i> , female | 42 |
| 10. CADDIS FLIES, SERICOSTOMATIDÆ. <i>Sericostoma personatum</i> (the welshman's button), larva; the welshman's button, male; <i>Notidobia ciliaris</i> , male; <i>Goëra pilosa</i> , female | 50 |
| 11. THE GRANNOM, BRACHYCENTRUS SUBNUBILUS. Egg sac; sacs expanded; young larvæ; larvæ nearly full-grown; pupal case; female fly with egg sac | 54 |
| 12. CADDIS FLIES. <i>Odontocerum albicorne</i> , female (grey sedge); <i>Leptocerus cinereus</i> , male (brown silverhorns); <i>Mystacides azurea</i> , male (black silverhorns); <i>Mystacides longicornis</i> , male (grouse wing) | 60 |
| 13. CADDIS FLIES. <i>Rhyacophila dorsalis</i> , larva; pupal case; pupa; female. <i>Philopotamus montanus</i> , female; <i>Hydropsyche instabilis</i> , female; <i>Chimarrha marginata</i> , female | 64 |
| 14. STONE-FLIES. <i>Perla maxima</i> , larva; <i>Perlodes microcephala</i> , female; <i>Perlodes microcephala</i> , male | 70 |
| 15. STONE-FLIES. Yellow sally, female; February red, female; willow fly, female; <i>Nemoura meyeri</i> , female; <i>Nemoura meyeri</i> , male | 72 |
| 16 DIPTERA, &c. Alder, female; <i>Chironomus tentans</i> , male; <i>Chironomus tentans</i> , female; brown ant; gravel bed | 78 |

LIST OF ILLUSTRATIONS

| FIG. | PAGE |
|--|------|
| 1. Wings of <i>Hydropsyche guttata</i> , ♂ | 11 |
| 2. Legs of <i>Silo nigricornis</i> | 21 |
| 3. Dorsal markings of :—1. <i>Ephemera vulgata</i> . 2. <i>Ephemera lineata</i> . 3. <i>Ephemera danica</i> . | 27 |
| 4. Hind-wing of olive spinner | 29 |
| 5. Hind-wing of <i>Baëtis binoculatus</i> , pale watery spinner | 30 |
| 6. Hind-wing of <i>Centroptilum luteolum</i> , pale watery spinner | 30 |
| 7. Hind-wing of <i>Centroptilum pennulatum</i> , pale watery spinner | 30 |
| 8. Fore-wing of <i>Baëtis</i> species | 31 |
| 9. Fore-wing of <i>Centroptilum</i> species | 31 |
| 10. Hind-wing of <i>Baëtis pumilus</i> , iron-blue spinner | 33 |
| 11. Hind-wing of <i>Ephemerella ignita</i> , sherry spinner | 35 |
| 12. Genitalia of <i>Ecdyurus venosus</i> , ♂, great red spinner | 36 |
| 13. Genitalia of <i>Phryganea striata</i> , ♂, from above . | 41 |
| 14. Genitalia of <i>Phryganea grandis</i> , ♂, from above | 42 |
| 15. Pupal grating of <i>Limnophilus lunatus</i> | 43 |
| 16. Pupal grating of <i>Limnophilus rhombicus</i> | 44 |
| 17. Genitalia of <i>Anabolia nervosa</i> , ♂, from above . | 45 |
| 18. Pupal grating of <i>Chætopteryx villosa</i> | 46 |
| 19. Genitalia of <i>Stenophylax stellatus</i> , ♂, from the side | 48 |
| 20. Head of <i>Sericostoma personatum</i> , ♂ (welsh- man's button) | 50 |

| FIG. | PAGE |
|---|------|
| 21. Genitalia of <i>Sericostoma personatum</i> , ♂ (welshman's button), from the side | 50 |
| 22. Pupal grating of <i>Sericostoma personatum</i> , the welshman's button | 51 |
| 23. Genitalia of <i>Notidobia ciliaris</i> , ♂, from the side | 52 |
| 24. <i>Goëra pilosa</i> , ♂, maxillary palpus | 53 |
| 25. Genitalia of <i>Goëra pilosa</i> , ♂, from above | 54 |
| 26. Genitalia of <i>Silo nigricornis</i> , ♂, from above | 54 |
| 27. Larvæ of <i>Brachycentrus subnubilus</i> (grannom) emerging from the eggs | 55 |
| 28. Genitalia of <i>Brachycentrus subnubilus</i> , ♂ (grannom), from beneath | 56 |
| 29. Pupal grating of <i>Brachycentrus subnubilus</i> , the grannom | 57 |
| 30. Genitalia of <i>Lepidostoma hirtum</i> , ♂, from above | 58 |
| 31. <i>Odontocerum albicorne</i> , ♂, portion of antenna, highly magnified | 59 |
| 32. Genitalia of <i>Leptocerus cinereus</i> , ♂, from the side | 60 |
| 33. Hooks connecting the anterior and posterior wings of <i>Mystacides nigra</i> | 62 |
| 34. Genitalia of <i>Mystacides nigra</i> , ♂, from above | 62 |
| 35. Genitalia of <i>Hydropsyche guttata</i> , ♂ | 64 |
| 36. Genitalia of <i>Polycentropus flavomaculatus</i> , ♂, from the side | 65 |
| 37. Genitalia of <i>Ryacophila dorsalis</i> , ♂, from the side. Dorsal plate | 67 |
| 38. Genitalia of <i>Agapetus fuscipes</i> , ♂, from above | 68 |
| 39. Genitalia of <i>Glossosoma vernale</i> , ♂, from the side | 69 |
| 40. <i>Perla maxima</i> , ♀, hind-wing | 72 |
| 41. <i>Perla cephalotes</i> , ♀, hind-wing | 73 |
| 42. Genitalia of <i>Leuctra geniculata</i> , ♂, from above | 75 |
| 43. Wings of <i>Leuctra hippopus</i> , ♂ | 76 |

THE
Dry-Fly Fisherman's
Entomology

BY
MARTIN E. MOSELY, F.E.S.

THE MARCH BROWN
A CORRECTION

GEORGE ROUTLEDGE & SONS, LTD.
68-74 CARTER LANE, LONDON, E.C.4

1932

THE DRY-FLY FISHERMAN'S ENTOMOLOGY

BY
MARTIN E. MOSELY, F.E.S.

*With Photogravure Portrait and 16 Plates, giving
72 Hand-coloured examples of natural flies of
interest to the trout-fisherman, as well as numerous
text illustrations.*

Bound in waterproof material, with flap, 42s. net.

“ The hand-coloured figures of seventy-two different flies which are given on sixteen plates seem to us to be very near perfection as exact representations.”—

The Field.

“ We do not remember anywhere else to have seen delineations and hues of aquatic insects rendered with such perfection as here. . . . In the legion of fishing books that are being produced there was real need for this, which is not strictly a fishing book at all and it fulfils that need most admirably.”—*The Times.*

“ A Dry-Fly Classic. No dry-fly angler's library will be complete without this book, nor will he be content to keep it as a shelf ornament.”—*Liverpool Courier.*

“ The pictures of insect life given are exquisite both as to their form and the delicate and life-like tints of colour.”—*Forest and Stream* (America).

“ This little book is one all dry-fly men ought to have, also all collectors of angling books, as I think it is going to be one of the items which will increase in value.”

The Fishing Gazette.

“ It should be in the library of every naturalist and of every fisherman.”—*Shooting Times.*

THE MARCH BROWN

A CORRECTION BY THE AUTHOR

Trout-fishermen for many generations have been puzzled by the appearance on the river of the March Brown during the summer and autumn months. They have considered, surely with reason, that the presence of a fly whose name is associated with the month of March, should be confined, more or less, to the early part of the year.

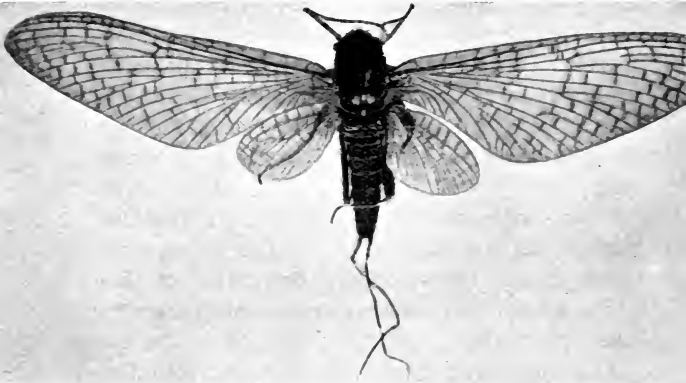
It was only in the spring of 1931 that an explanation was forthcoming. The fisherman's name, March Brown, covers two distinct flies which are not only different species but belong to different genera.

The true March Brown has now been found to be *Rhithrogena haarupi*, a fly described by Dr. P. Esben-Petersen in Denmark in 1909 and, until 1932, unrecorded in the list of British *Ephemeridae*.

It occurs in vast numbers during late March, April and sometimes early May, on many of our rivers, more particularly the Tweed.

This fly, for more than three-quarters of a century, has been confused, by fishermen and entomologists alike, with another insect, *Ecdyurus venosus*. The mistake originated in a faulty determination in the fifth edition of Ronalds's *Fly-Fishers' Entomology*. "Piscator", the

editor of this edition, misnamed the March Brown *Baëtis longicauda*—thus associating it with another and quite distinct insect. Eaton, in his monograph on Recent Ephemeridae, wrongly united *longicauda* and *venosus* under the name *venosus*, as one and the same, transferring them



By permission of ANNALS AND MAGAZINE OF NATURAL HIST

Fig. 1. *Rhithrogena haarupi*

to the genus *Ecdyurus*, and the March Brown has been known as *Ecdyurus venosus* ever since.

Mr. K. G. Blair, in 1931, separated the two species again and proved that *Ecdyurus longicauda* was in fact the Autumn Dun.

Ecdyurus venosus differs in its habits from the true March Brown. The latter insect appears on the water during early spring in great numbers in a succession of hatches throughout the day. One moment there is not a fly to be seen: the

next, the surface is covered as far as the eye can reach with myriads of this dingy-brown insect. Presently they are all gone and, perhaps, in an hour or so, a fresh hatch takes place.

The *Ecdyurus* species is less erratic and generally, there is a steady dribbling hatch, from mid-



By permission of ANNALS AND MAGAZINE OF NATURAL HISTORY

Fig. 2. *Ecdyurus venosus*

May onwards through the season even up to October, if weather conditions should be favourable. No great number is present on the water at any particular time.

These habits may perhaps furnish the fisherman with the easiest method of distinguishing the two species, should he wish to do so. Such a distinction, excepting for purposes of accuracy, is

not necessary from a fishing point of view since two flies, so nearly alike that they have deceived anglers and entomologists for generations, are hardly likely to be separable by the trout, and the same artificial pattern will serve for either.

For the entomologist, the distinctions lie in the genitalia and the neuration of the wings. In *Ecdyurus venosus*, the lobes of the penis are very broad and there are numerous cross-veinlets in the wings, more particularly towards the lower margin of the hindwing, so that this portion appears heavily shaded. In the imago or spinner, the numerous veinlets on the upper margin of the forewing towards the apex are generally forked. The margin of the last ventral segment is somewhat rounded in the male, pointed in the female.

In *Rhithrogena haarupi*, the lobes of the penis are narrow and cylindrical; the cross-veinlets of the wings are less numerous; in the imago the veinlets on the upper and apical margin of the forewing are generally simple, not forked; and, finally, the margin of the terminal ventral segment takes, in the male, the form of two rounded lobes with a rounded excision between and in the female it is excised and not pointed as in *Ecdyurus venosus*.

In the plates Fig. 1 is the true March Brown, *Rhithrogena haarupi*, and Fig. 2, *Ecdyurus venosus*, both female subimagines or duns.

INSECT LIFE AND THE MANAGEMENT OF A TROUT FISHERY

BY
MARTIN E. MOSELY, F.E.S.

*Illustrated with 57 Reproductions of Photographs
from nature by the author, a plan, and a frontis-
piece by Mr. John Henderson.*

Bound in Leatherette at 7s. 6d. net.

“ The chapters on the management of trout waters are full of good, practical advice, and so often convince the reader of error that they can almost be called revolutionary. The book should not be overlooked by those who like to ponder upon angling problems, and especially by those who have waters under their control.”

Times Literary Supplement.

“ We can truly affirm that no owner of a fishery should be without this book, and that he should not only have it in his library, but he should study it diligently.”—*Shooting Times.*

“ Technically it is a bit of work which does the publishers all credit, while the author conveys a great mass of information with an economy of words. A very good little book indeed.”—*Field.*

“ More and more fishermen are interesting themselves in the food of the fish they catch, and will be grateful to Mr. Mosely for his concise and technical, if simple, study of the insects and weeds of trout streams.”—*Spectator.*

“ Mr. Mosely has done the angling community in general good service with his book. It is extremely practical, and he has brought together in one volume a mass of material concerning caddis and nymph. Armed with this manual the angler can learn new facts about familiar waters—and, incidentally, choose his flies with greater wisdom. But its special appeal will be to the man who wishes to develop his water by improving the food supply on modern scientific lines.”—*Country Life.*

OTHER BOOKS ON FISHING

GREEN, G. GARROW. *Trout Fishing in Brooks : its Science and Art.* With eleven plates and other illustrations, second impression, cr. 8vo, 3s. 6d.

GRIMBLE, AUGUSTUS. *Salmon Rivers of the United Kingdom.* Three volumes, demy 8vo, each 10s. 6d. net.

Salmon Rivers of England and Wales. With 89 illustrations and map.

Salmon Rivers of Scotland. With 71 full-page plates and 3 maps.

Salmon Rivers of Ireland. With 78 illustrations and 2 maps.

HALFORD, F. M. *Modern Development of the Dry-Fly.* The new Dry-Fly Patterns, the Manipulations of Dressing them, and Practical Experiences of their Use. With 43 coloured and photogravure plates, med. 8vo, £1 11s. 6d.

SCOTT, JOCK. *Lake Fishing for Salmon, Trout, and Pike.* Illustrated, crown 8vo, about 6s. net.

The Dry-Fly Fisherman's Entomology

PART I

CHAPTER I

THE COLLECTION AND PRESERVATION OF WATER INSECTS

It will not be out of place if, in the opening chapter of this book, I give a few lines on the collection of water insects. My own collecting takes place solely on my fishing expeditions, and consequently I have been obliged to reduce collecting material to a compass which enables it to be disposed of in my fishing-bag, supplemented by my pockets, without unduly encroaching on the space allotted to the fishing tackle. Collecting water insects.

A net of some kind is almost indispensable, The net. and mine was obtained from J. Gardiner, naturalist, of High Holborn. It is a jointed brass ring with a cheese-cloth bag, and is fitted with a clamp, which enables it to be fixed to the handle of my landing-net, or any stick of a similar or nearly similar size. When not in use, it can be folded up into quite a small

2 COLLECTION OF WATER INSECTS

compass and put away in the fishing-bag until wanted. The net will be found of great use for the collection of spinners of the EPHEMERIDÆ and many of the caddis-flies.

When collecting duns, I seek an eddy, or a spot where the set of the stream carries the flies in under the bank, and then lift them off the water on the rim of my landing-net.

Collecting tubes.

Two tubes may be carried in the waistcoat pocket, each 2 inches in length by $\frac{1}{2}$ inch in diameter, the one containing collecting fluid, and the other a few lumps of cyanide of potassium embedded at the bottom of the tube in plaster of Paris. In another pocket may be placed a pair of magnifying glasses, one giving a magnification of about ten, and the other of about twenty diameters. This comprises the entire field outfit.

Lenses.

Collecting fluid.

The collecting fluid is made up of one part of alcohol to two parts of 2 per cent. formalin solution (described below), a few crystals of menthol being dissolved in the mixture, which should then be filtered.

Formalin solution.

On returning to my headquarters, I transfer the insects in the collecting fluid to tubes or glass-stoppered bottles containing a 2 per cent. solution of formalin, made by taking one part of commercial formalin, which is a 40 per cent. solution of formic aldehyde, and adding to it nineteen parts of water. If insects are left too long in collecting fluid, the alcohol contained therein is apt to destroy the colour.

The flies collected in the cyanide tube I set

out on the ordinary entomological setting-boards, and, when quite dry, transfer to my cabinet. The TRICHOPTERA, or caddis-flies, may be displayed to advantage by this method, but the more delicate insects, such as the EPHEMERIDÆ and many of the PERLIDÆ, lose their form and colour entirely during the process of drying, and become so brittle that the slightest breath of air brings about their disintegration.

Then comes the problem of sending the captures through the post, or of taking them to their permanent quarters in such a manner that they may arrive undamaged. I have frequently received from correspondents flies which have arrived in so fragmentary a condition that their correct determination has been rendered impossible. On occasions I have received boxes in which caddis, or EPHEMERIDÆ nymphs, have been packed alive, and in most cases these have come to hand with the contents in such an advanced state of decomposition that their instant destruction has been required.

I would impress upon collectors, who may be desirous of sending specimens by post, that EPHEMERIDÆ or PERLIDÆ *must* be preserved in fluid, and that if TRICHOPTERA or other insects are sent dry, they should be pinned through the thorax and placed in entomological boxes sold for the purpose, care being taken that the pins are inserted as firmly as possible into the cork. For single

Sending
insects by
post.

4 MOUNTING INSECTS IN FLUID.

specimens of small size, I have frequently used a collecting tube in place of a box, pinning the specimen securely to the under-side of the cork.

If insects are to be sent in fluid, then the tube or bottle containing them must be filled with the preservative quite up to the cork, so that the air is entirely excluded. To effect this, the vessel should be filled to overflowing, and the cork worked in by pressing it from side to side as it is being pushed home. If a big air-bubble is included, it will travel up and down the tube, causing much damage to the contents. I have given up the use of cotton-wool in the tubes, as recommended by Mr. Halford, as I found that the legs and other parts of insects adhered to it and frequently became detached.

TRICHOPTERA with immensely long and slender antennæ, sent to me by Mr. Jack Henderson from so far off a land as the Federated Malay States, have arrived in perfect condition, owing to the precaution of filling the bottle quite full having been observed.

From time to time I have been asked to describe the method by which specimens in the Halford cabinets at the Fly Fishers' Club are mounted. I propose to devote a few lines to the subject in this chapter.

Mounting
insects in
formalin at
the Fly-
Fishers'
Club.

Glass blocks.

The specimens are mounted in glass blocks, which may be obtained from Messrs. F. H. Taylor & Sons of King's Cross. The blocks have to be made specially for the purpose, and con-

sequently may be cut to any size required. In the Halford cabinets, blocks $2\frac{1}{4}$ inches square are used.

The cement for securing the cover is Hollis' Cement. Liquid Glue, which may be obtained from Mr. Charles Baker, optician, of High Holborn.

The method of manipulation is as follows. Clean the glass with methylated spirit, rubbing it with a silk handkerchief, and fill the cavity ground into the block half-full of 2 per cent. formalin solution. Place the insect in position, and examine it carefully with a lens to make sure that there is no extraneous matter adhering. The cement should then be painted fairly thickly and evenly round the flat top of the cell, care being taken that it does not approach the extreme edge of the cavity. Then fill up the cavity until the fluid presents a convex surface. The precaution should here be observed of again examining the contents of the cavity with the lens in case any dust or hairs may have dropped in.

Take the cover, which must be quite clean, and breathe heavily upon the under-side. Lay the edge along the cemented edge of the cell, and lower gradually into place, the surplus fluid being partly driven out at the opposite side. There will remain a film of fluid which prevents absolute contact between the cover and the cemented surface. This may be drawn off by the use of strips of blotting-paper. It is of importance to avoid all pressure, and, when the surplus fluid has been removed, the

6 MOUNTING INSECTS IN FLUID

cover will settle down into its place by its own weight.

Subsequently the sides of the cell should be thickly painted with cement along the line of the juncture of the cover with the block, two or three coats being given, and an interval of a day or two left between the application of each coat to allow the cement to harden thoroughly.

Varnishing
the cell.

Finally, the cell may be ringed with black varnish, for which purpose a turn-table is required. At the Natural History Museum, instead of varnish, paper covers have been used to hide the unsightly corners, and they seem to answer the purpose admirably.

CHAPTER II

THE DETERMINATION OF GENERA AND SPECIES

THE majority of anglers will no doubt be content with the correct application of the popular names, where such exist, and to these I would recommend that the following pages be passed over and reference made at once to the coloured plates, which form, perhaps, the most important feature of this book.

Determina-
tion of
species.

For the benefit of the trout fisherman who seriously wishes to identify not only the genus but also the species of insects which his artificial patterns are intended to represent, I will describe the system of examination which may be adopted on entering into the study of the families concerned.

A few general remarks may not be out of place. For the purposes of classification, the insect kingdom is divided into what are termed *Orders*. *Orders* are sometimes divided into *sub-orders*. These again are split up into *Families*. In the *Families* are grouped various *Genera*, and the *Genera* themselves contain *species*, which individual insects represent. Insects showing some slight difference from the type of an unimportant character are termed *varieties*.

Classifica-
tion.

An insect is, roughly speaking, divided into

8 THE ORGANS OF INSECTS

The Head. three main parts—the head, the thorax, and the abdomen. The head is furnished with eyes, *antennæ*, the mouth-parts, and in certain species, organs supposed to diffuse scent, or to be capable of guiding the male to the female.

The Antennæ. The *antennæ* are regarded as sense-organs, discharging olfactory and even auditory functions by means of particular parts. They are composed of numerous joints, and are inserted between or in front of the eyes.

The Mouth-parts. The mouth-parts of insects are somewhat complicated. In the Orders with which we are here concerned, they consist of a *labrum* or upper lip, a pair of *mandibles* or biting jaws, which in the adult members of the EPHEMERIDÆ and TRICHOPTERA¹ are much modified and even atrophied, a second pair of jaws, termed *maxillæ*, and then the *labium* or lower lip, which is really made up of a second pair of *maxillæ* welded to the *labium*.

The Palpi. Attached to the *maxillæ* are their *palpi*, which are jointed processes, and organs of touch. Thus there are usually four of these processes²—two attached to the first pair of *maxillæ* and termed *maxillary palpi*, and two attached to the second pair of *maxillæ*, or the *labium*, and called *labial palpi*. These palpi are of great

¹ Certain species of the TRICHOPTERA are apparently able to partake of fluid or soft food by suction in the absence of serviceable mandibles. When dissecting specimens for microscope preparations, I have frequently found food in the alimentary canal in quite appreciable quantities.

² In certain genera of the TRICHOPTERA the palpi are atrophied, or completely absent.

importance in the scheme of classification of the Trichoptera.

Packard writes: "Of the eyes of insects The Eyes. there are two kinds, the simple and the compound. Of the former there are usually three, arranged in a triangle near the top of the head between the compound eyes."

The simple eye, known as the *ocellus*, consists of a single lens. The compound eye is the *oculus* or *ommateum*, and is composed of a large number of *ocelli* lying in close juxtaposition.

In the EPHEMERIDÆ, the *oculi* of the male are invariably larger than those of the female, and are formed after a somewhat different model.

It should be noted that the presence or absence of *ocelli* is of importance in the correct determination of *genera* in the TRICHOPTERA.

The thorax is made up of three distinct The Thorax. segments, each of which carries a pair of legs, the wings being attached, the fore-wings or wing-covers to the second, and the hind-wing, when present, to the third segment. The first segment is termed the *prothorax*; the second, the *mesothorax*; and the third the *metathorax*.

The fore-wing is known entomologically as the anterior wing, and the hind-wing as the posterior wing.

Wings are composed of double chitinous mem- The Wings. branes, strengthened by an elaborate system of nervures and cross nervures, of much importance in furnishing characters for sub-classification. I give here drawings of the anterior and posterior wings of one of the TRICHOPTERA

species — i.e. *Hydropsyche guttata* — with the various nervures and spaces between them named. The student will be well advised to master the details shown, as constant references are made to them in systems of classification. (Fig. 1.)

The Legs.

The leg is divided into five parts—the *coxa* or hip, the *trochanter*,¹ the *femur* or thigh, the *tibia* or shank, and the *tarsus* or foot. The *tarsus* consists of one to five segments, and terminates in either one or two claws called *ungues*, between which is a pad called the *pulvillus*. In some genera of the *Hydropsychidæ*, in the male, the outer claw is malformed or is replaced by a tuft of strong hairs, the claws of the female being normal. The *pulvillus* is sometimes regarded as a sixth segment of the *tarsus*.

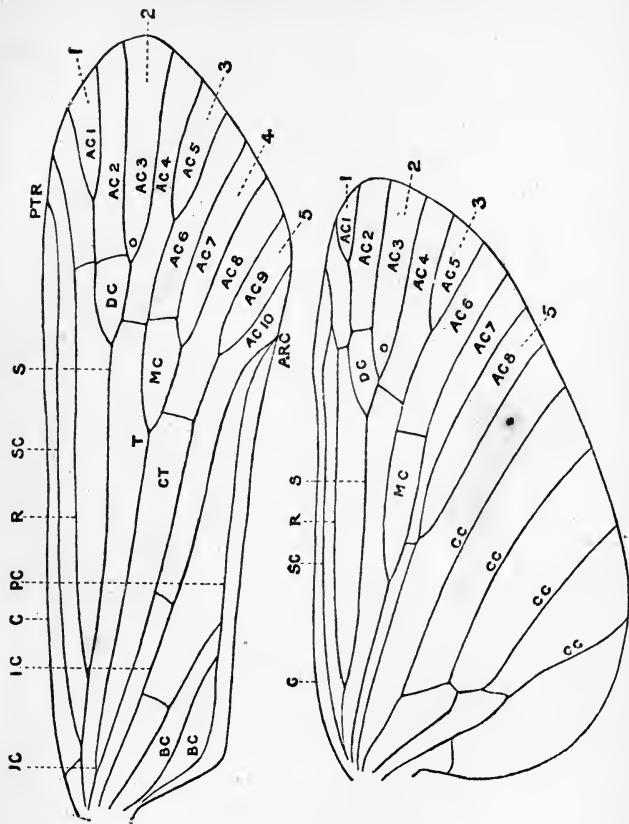
The Spurs.

In many Orders and Families, the legs are furnished with spurs as well as spines and hairs. The former are usually of a greater transparency than the latter, and their arrangement and number are of such importance in the determination of the TRICHOPTERA that I have detailed them in a special table on p. 20.

The Abdomen.

The abdomen as a general rule is composed of ten segments, and contains the more import-

¹ There is a doubt as to whether the *trochanter* should be termed a separate division, some writers considering it merely a subdivision of the *coxa*. In certain genera of the EPHEMERIDÆ the legs are atrophied and the joints formless. These insects must pass the whole of their adult life in the air, the metamorphosis from the sub-imago to the imago stage taking place whilst in flight.



- C. costa.
- SC. sub-costa.
- R. radius.
- S. sector.
- DC. discoidal cell.
- UC. upper cubitus.
- MC. median cellule.
- CT. cellula thyridii.
- T. thyridium.
- IC. inferior cubitus.
- ARC. arculus.
- PC. post-costa.
- BC. basal cellules.
- AC 1-10. apical cellu'es.
- 1-5. apical forks.
- PTR. pterostigma.
- CC. costulae.
(posterior wing only.)

FIG. 1.—Wings of *Hydropsyche guttata*, ♂.

ant organs of the body. In most insects the generative processes are situated at the hinder end, and furnish very important characters in classification. Here also are inserted, where present, the *setæ* or tails.

So much for general features. The earnest student should possess himself of "A Revisional Monograph of Recent Ephemeridæ or May Flies," by the Rev. A. E. Eaton, M.A., published in the "Transactions of the Linnean Society," and secondly, of "A Monographic Revision and Synopsis of the Trichoptera of the European Fauna," by Robert McLachlan, F.R.S., F.L.S., published by John Van Voorst.

Mr. Eaton has very kindly allowed me to publish here some notes on the EPHEMERIDÆ, which he drew up in MS. for Mr. Halford many years ago, and entitled "An Unscientific Analytical Synopsis of the Genera of British Ephemeridæ, based upon the Adult Flies" (the imagines or spinners). Personally, I have found these notes invaluable, and all trout fishermen may be glad to avail themselves of the ready help thus afforded.

An Unscientific Analytical Synopsis of the Genera of British Ephemeridæ, based upon the Adult Flies.

- | | |
|--|---|
| 1.—Tail bristles three in number, all nearly of the same length | 2 |
| —Tail bristles two in number, the median bristle being aborted, or extremely rudimentary | 7 |
| 2.—Wings four in number | 3 |

Works on
EPHEME-
RIDÆ and
TRICHOPTERA.

The
EPHEME-
RIDÆ.

Mr. Eaton's
notes on the
EPHEME-
RIDÆ.

- Wings two in number. Eyes alike in both the sexes and rounded evenly. Fly very small CÆNIS.
- 3.—Eyes alike in both sexes, and rounded evenly. Fly of a large or moderate size 4
- Eyes rounded evenly in the female, but intersected transversely by an impressed line in the male (excepting, perhaps, in *Habrophlebia*, which is a fly of small size) 5
- 4.—Wings usually spotted. Sexual forceps-limbs of the male four-jointed, with the basal joint short and the next joint much the longest EPHEMERA.
- Wings spotless. Forceps-limbs of the male three-jointed, with the basal joint much the longest POTAMANTHUS.
- 5.—Front edge of the hind-wing somewhat arched, scarcely at all receding in the middle of the curve 6
- Front edge of the hind-wing strongly angulated nearly in the middle, and with a deep sinus or recess immediately beyond the angle. Forceps-limbs of the male three-jointed; the basal joint, shorter than the remainder, is dilated inside at the base; the other two joints are rather long, and resemble those of a finger HABROPHLEBIA.
- 6.—Forceps-limbs of the male three-jointed, with the basal joint much larger than the remainder LEPTOPHLEBIA.
- Forceps-limbs of the male three-jointed; the intermediate joint much the longest, the other joints very short EPHEMERELLA.
- 7.—Tarsi of the hinder pairs of legs four-jointed. Eyes of the male divided into two unequal parts; the upper segment, cylindrical or somewhat turbinate, is faceted only on its terminal surface; the lower and much smaller segment, of oval form, is faceted all over with facets of less diameter than those of the other segment. Fly small 8

14 SYNOPSIS OF THE EPHEMERIDÆ

- Hinder tarsi five-jointed. Eyes of the male evenly contoured and undivided; their lower and lesser facets sometimes different in colour from the upper and larger facets.
 Fly usually large 10
- 8.—Hind wings minute 9
- Hind wings completely absent . . . CLOËON.
- 9.—Hind wings broad, obtuse BAËTIS.
- Hing wings minute, very narrow.
- CENTROPTILUM.
- 10.—Tarsus in the hinder legs shorter than the tibia, even when subequal in length thereto; its first joint hardly perceptibly shorter than the second; the claws mutually dissimilar, one blunt, the other hooked AMELETUS.
- Hind tarsus longer than the tibia; its first joint distinctly longer than the second; tarsal claws all narrow and hooked. SIPHLURUS.
- Hinder tarsi shorter than the tibix 11
- 11.—Lobes of the male intromittent organ narrow. Femora usually marked in the middle with a dark spot or elongate streak.
- RHITHROGENA.
- Penis lobes broad. Femora in some cases dark-banded in the middle, not spotted 12
- 12.—First joint of the hind tarsus shorter than the second joint. Flies yellowish in their general colouring; the wings of the sub-imago especially so HEPTAGENIA.
- First joint of the hind tarsus as long as or longer than the second joint. Flies brownish, varied with black; wings of the sub-imago greyish, and in some species (e.g. *venosus*) are crossed by dark bands before the moult ECDYURUS.

Let us suppose that the angler has caught his fly, and being anxious to identify it, refers to the above table. The fly, we will assume, is a

mayfly. He examines it, and turning to the table finds: 1. Tail bristles three in number, all nearly of the same length. This describes the insect in his hand, and at the end of the line he finds the number 2. He refers to the paragraph indicated—*i.e.* with the No. 2 on the left-hand side—and reads, Wings four in number . . 3. This is also descriptive of his mayfly, so he disregards the alternative and goes on to paragraph 3, as directed on the right-hand side. Paragraph 3 is a little more complicated, but as his fly is of a fairly large size he passes on to 4, and there runs his quarry down, either by the spotted wings or, with more certainty, the form of the forceps-limbs of the male. If, however, when at 3, he had accepted the alternative, he would then have had to pass on to 5 or 6, and would have found that all the insects therein described possessed forceps-limbs composed of three joints, whereas in the fly under examination four joints are present, and this should send him back again, and put him on the right track.

CHAPTER III

CLASSIFICATION OF THE TRICHOPTERA

TRICHOPTERA.

THE TRICHOPTERA are no longer considered a Sub-Order of the NEUROPTERA, and have been classed as a distinct Order. They are divided into two main groups, according to the relative number of joints in the maxillary palpi of the two sexes, the INÆQUIPALPIA and the ÆQUIPALPIA.

INÆQUIPALPIA.

Amongst the INÆQUIPALPIA are grouped the families in which the maxillary palpi consist of fewer than five joints in the male, but five joints in the female.

ÆQUIPALPIA.

In the ÆQUIPALPIA the maxillary palpi are five-jointed, and as a rule alike in form in both sexes.¹

Thus the families found in Britain are grouped as follows :

Families in the TRICHOPTERA.

INÆQUIPALPIA

Phryganeidæ

Limnophilidæ

Sericostomatidæ

ÆQUIPALPIA

Odontoceridæ

Leptoceridæ

Molannidæ

Hydropsychidæ

Polycentropidæ

Psychomyidæ

Philopotamidæ

Rhyacophilidæ

Hydroptilidæ

¹ A six-jointed maxillary palpus is a very remarkable feature of a female *Anisocentropus* (?) sent by Mr. J. Henderson from the Malay States, and mounted in Canada balsam in my collection.

I have departed from the classification in the "Dry-Fly Man's Handbook," and have adopted here that of George Ulmer, who subdivides the *ÆQUIPALPIA* into nine families as against the four described by McLachlan.

The characters given in the following table apply to British Families.

Characters
of the
Families.

INÆQUIPALPIA. The males with three or four joints to the maxillary palpi, the females with five joints.

Phryganeidæ. Maxillary palpi of the male four-jointed; form similar in both sexes; ocelli present.

Limnophilidæ. Maxillary palpi of the male three-jointed; form similar in both sexes; ocelli present.

Sericostomatidæ. Maxillary palpi of the male always formed in a different manner from those of the female; very hairy, sometimes covered with scales, and with the number of joints three, or very obscure; ocelli mostly absent.

ÆQUIPALPIA. Maxillary palpi five-jointed in both sexes.

Odontoceridæ. Maxillary palpi strongly hairy, having the fifth joint not sub-articulated. Median cell of the anterior wings absent. Discoidal cell in both wings closed. Between the radius and the first apical sector there is a cross vein, or the radius merges in the first apical sector. The second apical fork in the anterior wings wanting, or only occasionally distinct. Ocelli absent.

Leptoceridæ. Maxillary palpi strongly hairy, with the last joint usually long but simple, often flexible; in some species the fourth joint is also flexible.¹ Anterior wings usually narrow and very hairy.

¹ This does not appear to have been noticed in their works by writers on the TRICHOPTERA.

18 CHARACTERS OF THE FAMILIES

Median cell of the anterior wings and the discoidal cell of the posterior wings nearly always open or absent. Radius and first apical sector normal. Second apical fork in the anterior wings absent, though occasionally indications of it may be seen. Ocelli absent.

Molannidæ. Maxillary palpi densely hairy, the terminal joint not sub-articulated. The median cell and discoidal cell always absent. The nervures ending in the apical margin reduced in numbers. Ocelli absent.

Hydropsychidæ. Maxillary palpi but slightly hairy, the last joint whip-shaped and multi-articulate. First apical fork always present in the fore-wings. Ocelli absent; the anterior tibiæ never furnished with more than two spurs.

Polycentropidæ. Maxillary palpi but slightly hairy, the last joint whip-shaped and multi-articulate. Ocelli absent. Anterior tibiæ furnished with three spurs.

Psychomyidæ. Maxillary palpi but slightly hairy, the last joint whip-shaped and multi-articulate. First apical fork absent in the anterior wings. Ocelli absent. Anterior tibiæ never furnished with more than two spurs.

Philopotamidæ. Maxillary palpi but slightly hairy; the last joint whip-shaped and multi-articulate. Ocelli present. Anterior tibiæ very seldom furnished with more than two spurs.

Rhyacophilidæ. Maxillary palpi but slightly hairy; last joint similar in structure to the others, and not sub-articulate. Ocelli present. The anterior tibiæ with three or two spurs. Pupa enveloped in a cocoon.

Hydroptilidæ. These insects are so minute as to be of no practical value to the fisherman, but to complete these descriptions I give the following points: Fore tibiæ with never more than one spur. Ocelli absent or present according to genera. Anterior wings clothed with strong, dense, "brushed-up" hairs. Neuration greatly simplified.

McLachlan classed the *Leptoceridæ*, *Odontoceridæ*, and *Molannidæ* together in one family, namely, the *Leptoceridæ*, and the *Hydropsychidæ*, *Polycentropidæ*, *Psychomyidæ*, and *Philopotamidæ* in another family, with the general name *Hydropsychidæ*; but he suggests that his classification must not be considered final, and that with greater knowledge of European and extra-European forms, further subdivision of families might become necessary. Continental writers have adopted all his suggestions and ideas to this effect.

If the student is unable to decide from the above general characters to which of the families the insect under examination belongs, he will derive assistance from the number and position of the spurs of the legs, care being The Spurs. taken to distinguish between the spurs, which are usually long and transparent,¹ and the spines, generally darker in colour, with which species of certain genera are abundantly furnished. Fig. 2 shows the position of the spurs on the tibiæ of *Silo nigricornis*.

I have compiled a table based on these spurs, and have found it of assistance in suggesting the genera, to which reference may be made when attempting to identify some unfamiliar species. I give it on the next page.

¹ The spurs of a pair are not always equal in length, and sometimes differ in form from each other. In some genera the male has fewer spurs than the female, and a spur on one pair of legs may be peculiar in form, as in the genera *Colpotaulius* and *Dipseudopsis*, of which the former occurs in this country.

(The symbol ♂ is the entomological sign for the male, and ♀ for the female sex.)

- Spur tables.
- 0.2.2. Mystacides, Setodes, Œcetis, Enoicyla.
 - 0.2.4. Hydroptila.
 - 0.3.3. Chætopteryx, ♂.
 - 0.3.4. Agraylea, Allotrichia, Ithytrichia, Orthotrichia, Oxyethira, Micropterna ♂, Mesophylax ♂.
 - 1.2.2. Triænodes, Erotesis, Adicella, Œcetis.
 - 1.2.3. Ecclisopteryx.
 - 1.2.4. Apatania.
 - 1.3.3. Halesus, Chætopteryx ♀, Drusus.
 - 1.3.4. Colpotaulius, Grammotaulius, Glyphotælius, Limnophilus, Anabolia, Phacopteryx, Asynarchus, Stenophylax, Mesophylax ♀, Micropterna ♀.
 - 1.4.4. Chimarrha.
 - 2.2.2. Leptocerus.
 - 2.2.4. Sericostoma, Notidobia, Beræa, Beræodes.
 - 2.3.3. Brachycentrus.
 - 2.4.4. Neuronina, Phryganea, Agrypnia, Goëra, Silo, Crunœcia, Lepidostoma, Lasiocephala, Odonotocerus, Molanna, Hydropsyche, Diplectrona, Philopotamus, Wormaldia, Tinodes, Lype, Psychomyia, Glossosoma, Agapetus.
 - 3.4.4. Plectrocnemia, Polycentropus, Holocentropus, Cynus, Ecnomus, Neureclipsis, Rhyacophila.

Hints may be obtained, when identifying species, from the relative length of the joints of the maxillary palpi, the arrangement of the wing neuration, and I would refer my readers to the figure given on p. 11 of the neuration of the wings of *Hydropsyche guttata*. Finally, but most important of all, the student must examine the formation of the genitalia of the male insect with the utmost care, as differences in the structure of these parts give some of the chief

characters on which the modern system of classification is based.

I do not propose to deal at length with the PERLIDÆ, and the odds-and-ends of insect life which go to furnish the trout's larder. A few figures of these insects are given, and these with the accompanying descriptions will no doubt prove sufficient for the requirements of most

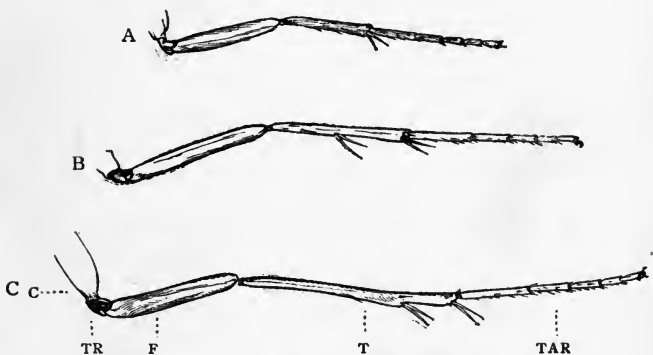


FIG. 2.—Legs of *Silo nigricornis*.

A. Anterior leg. B. Median leg. C. Posterior leg.

C. coxa. TR. trochanter. F. femur. T. tibia. TAR. tarsus.

trout fishermen. At the end of this book I give complete lists of described British EPHEMERIDÆ, TRICHOPTERA, and PERLIDÆ, and a table showing the genera and species of these Orders observed on a typical chalk stream, the Test, and the species that have been sent me from time to time from a typical rough country river, the Derbyshire Dove; giving in each case the months during which the insects occur,

PART II

THE EPHEMERIDÆ

EPHEME-
RIDÆ.

MR. HALFORD in the second part of "The Dry-Fly Man's Handbook" has dealt fully with the metamorphoses of the EPHEMERIDÆ. I will therefore content myself with just stating the bare fact that there are four stages in the life-history of these interesting little flies—the egg, the larva or nymph, the sub-imago, which fishermen term the dun, and the imago, which they call the spinner.

It will be as well for the angler to bear in mind that the duns of both sexes are to be found on the surface of the stream when emerging from (generally called by the fisherman "hatching out of") the nymphal covering; that the female imago returns to the water to deposit her eggs, sometimes even climbing down some weed stem or stone, and descending below the surface for this purpose, and subsequently falls "spent," and is carried down on the surface by the current with wings outstretched; but that the male imago is only occasionally present on the water, and then merely by the accident of a sudden gust of wind, or through death

chancing to take place when the insect is hovering over the river. Normally, the male imago passes its existence in sheltered places, sometimes quite a long distance from the stream waiting to copulate with the female. These points have an important bearing on the choice of patterns for the day's fishing.

Family . . . EPHEMERIDÆ

Genus . . . *Ephemera*

Species . . . $\left\{ \begin{array}{l} \textit{danica} \\ \textit{vulgata} \\ \textit{lineata} \end{array} \right.$

The may-fly.

PLATE I

There can be few English, or even British fly-fishermen who have not, at some time or other, made the acquaintance of at least one of the species of *Ephemera* found in this country. All three species are popularly termed may-flies; but in the North, fishermen sometimes apply the name to insects forming part of quite a different group, *Perla cephalotes* or *Perla maxima*, which are PERLIDÆ or Stone-flies.

The three species occurring in these islands are *Ephemera danica*, *Ephemera vulgata*, and *Ephemera lineata*, the last named being rarely found. Mr. Eaton describes them in the following words :

“ *Ephemera vulgata*. The dorsal markings of the abdomen are a pair of pitch-brown, curvilinear trilateral spots, broadest at the base of *Ephemera vulgata*.

the segment, and ending at its thickened hind margin abruptly, and a pair of fine curved longitudinal lines interposed between these spots, often effaced. The ventral markings are a pair of longitudinal, sub-parallel, abbreviated fine black lines, and between them, near the base of the segment, two shorter lines, convergent towards each other. The markings are upon a very light olivaceous ground colour."

Mr. Eaton continues :

"No. 1 (*Ephemera vulgata*) inhabits rather warmer waters than No. 2 (*Ephemera danica*). At Romsey I have found the nymph of No. 1 in the ditches adjoining the river. In Dorsetshire you would find it the abundant species along the Stour, near Blandford and Wimbourne, where the banks and bed of the river are clayey or muddy. Common at Burton-on-Trent. Doubtless the most abundant species in the rivers of the eastern counties."

Personally, I have only met with *E. vulgata* on the Middlesex Colne, finding it in fair numbers at Uxbridge, and on a deep and sheltered lake up in the hills near Romsey, where I have taken one or two specimens.

To continue Mr. Eaton's descriptions :

"*Ephemera danica*. The anterior four or five abdominal dorsal segments are ivory-white, marked on each side at the base with a broad triangular pale cinereous blotch which points backwards. In some of the hinder segments (which are varied with pitch-brown or very intense brown-ochre instead of cinereous) some-

PLATE 1.

THE MAY-FLY (*Ephemera danica*)

Nymph (male)

Sub-imago (male) .

Imago (female)

1917

1917

1917

PLATE I





times an abbreviated thin streak on each side of the dorsal vessel, at the base of the segment, is flanked by a longer and broader tapering streak (represented sometimes by a triangular spot in the anterior segments), which does not extend either to the side or to the hind margin of the segment; sometimes these markings coalesce, so as to leave an ivory-white triangle pointing forward upon the middle of the hind margin of the segment. Ventral markings, a pair of longitudinal linear brown-black streaks.

“This species usually inhabits colder and swifter waters than *Ephemera vulgata*. It is abundant in Dovedale, Derbyshire, and in many streams in the North of England. In Dorsetshire it inhabits trout streams and the River Axe. It would probably be found in the Itchen, and it may occur in the Test above Romsey. It is the mayfly of anglers in trout and grayling waters.”

I would supplement the above remarks by stating that I have found *Ephemera danica* on the Test, the Itchen, the Taw. It is at times so plentiful on the Kennet that in the neighbourhood of Thatcham the Great Western trains have been invaded, and these prolific insects have been found in the railway carriages. On Lough Arrow, near Boyle, in Ireland, vast numbers appear, usually earlier than on south-country streams. In this lake not only do the very largest trout, fish up to 10 lb., feed upon the spent imagines, but flocks of sea-birds are attracted by their advent, and I have seen

black-headed gulls hopping about amongst the trees from twig to twig, with all the agility of the little sparrow, in their eagerness to take toll of these tit-bits of the insect world.

Mr. Eaton writes of *Ephemera lineata* :

*Ephemera
lineata.*

“Anterior segments greenish-grey, modified with bistre-brown; hinder segments more of a yellowish-brown. The dorsal markings of the segment consist of longitudinal, curved, or slightly sinuous black streaks tapering at both ends—viz. in the anterior segments, two such streaks, which are long, on each side of the middle of the back; in the hinder segment, between these two pairs of streaks, two short black lines from the base of the segments. Ventral markings, a pair of longitudinal black lines.

“I have met with this species in England only in the neighbourhood of Reading in Berks.”

Personally, I have never found this species, but I give the description in case other angler-entomologists should be more fortunate. The figure given in the “Dry-Fly Man’s Handbook,” showing these markings, is reproduced here by the kind permission of Mr. Halford. *Ephemera vulgata* and *Ephemera danica* were drawn from specimens in my possession, and the single segment showing the markings of *Ephemera lineata* is reproduced from a drawing by Mr. Eaton in the “Transactions of the Entomological Society.” (Fig. 3.)

It should be noted that Mr. Eaton’s descriptions given above have reference to the imagines only.

The nymph shown is a male *Ephemera danica*. May fly-
nymph.
I made an attempt a year or so ago to rear this species in an aquarium containing a varied assortment of EPHEMERIDÆ, TRICHOPTERA, shrimps and snails. I kept the larvæ alive for some months, and was much interested in watch-

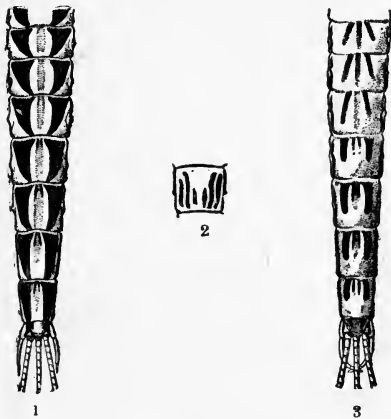


FIG. 3.—Dorsal markings of:—

1. *Ephemera vulgata.* 2. *Ephemera lineata.*
3. *Ephemera danica.*

ing their method of locomotion. The sand and grit on the floor of the aquarium would heave, as if a miniature earthquake were taking place, and presently a head and flank would appear pressed against the glass as the nymph made its way along, parallel with the side of the aquarium, several inches beneath the soil.

From time to time a nymph would come

up to the surface of the sand and grit which covered the bottom, in order to slough its skin, to keep pace with growth, and then every living thing in the aquarium would set upon it, and the unfortunate insect would be devoured piecemeal. I did not succeed in rearing a single specimen to maturity, as the nymph is quite helpless to defend itself. When disturbed it feigns death, and will remain motionless for as long a space as a quarter of an hour. Then when it thinks that the danger is past, it burrows into the soil with incredible rapidity by means of its powerful forelegs, median legs, and wedge-like head. It swims through the water with an undulating movement of the body.

Spent gnat.

Spent gnat is a term applied by fishermen to the female imagines or spinners of any *Ephemera* after the eggs have been voided and the insect is floating down the stream "spent" from the labours of egg-laying, and in a dead or dying condition.

Olive dun
and olive
spinner.

| | | | | | | | |
|---------------|---|---|---------------|----------------|--------------------|--------------|------------------|
| Family . . . | EPHEMERIDÆ | | | | | | |
| Genus . . . | <i>Baëtis</i> | | | | | | |
| Species . . . | <table> <tr> <td rowspan="5" style="font-size: 4em; vertical-align: middle;">{</td> <td><i>vernus</i></td> </tr> <tr> <td><i>rhodani</i></td> </tr> <tr> <td><i>atrebatinus</i></td> </tr> <tr> <td><i>tenax</i></td> </tr> <tr> <td><i>buceratus</i></td> </tr> </table> | { | <i>vernus</i> | <i>rhodani</i> | <i>atrebatinus</i> | <i>tenax</i> | <i>buceratus</i> |
| { | <i>vernus</i> | | | | | | |
| | <i>rhodani</i> | | | | | | |
| | <i>atrebatinus</i> | | | | | | |
| | <i>tenax</i> | | | | | | |
| | <i>buceratus</i> | | | | | | |

PLATE II

Fishermen in practice apply the collective names olive dun and olive spinner to various

PLATE 2.

BAËTIS SPECIES

Olive dun (male)

Dark olive dun (male)

Olive spinner (female, spent)

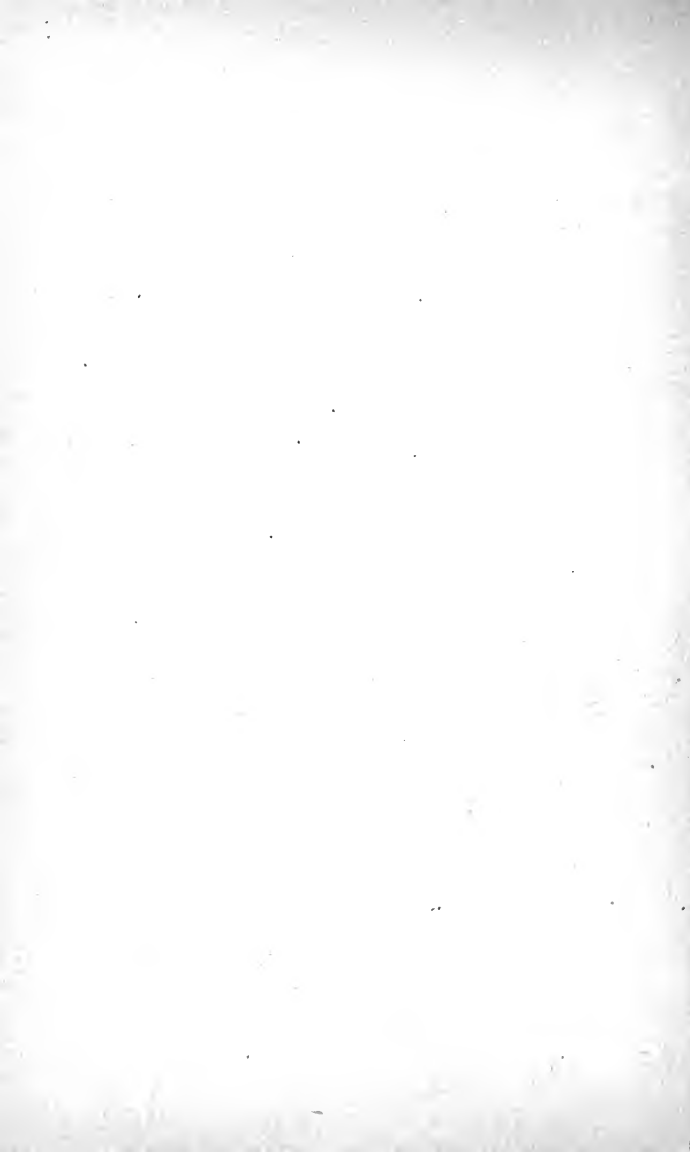
Olive spinner (female)

Olive spinner (male)



PLATE 2





species of the genus *Baëtis*, and for all practical angling purposes they are fully justified in so doing. The differences between the species lie mainly in the form of the sexual forceps of the male, and can only be distinguished by the aid of a powerful glass. As appears in the heading, five species are merged in the name olive dun. One of the distinguishing features of the genus is the broad few-veined hind-wing, of which a figure is here given (Fig. 4).



FIG. 4.—Hind-wing of olive spinner.

The olive dun is the sheet-anchor of the fisherman, and is present during every month of the fishing season. The dark olive appears in the winter and spring, and its identity has not yet been determined. Whether its distinctive colour is a mere variation or is peculiar to a particular species is as yet uncertain, and further investigation will be required to throw light upon this point.

When spent, the female olive spinner assumes Red spinner the reddish-brown, or dead-leaf colour, which has given rise to the popular name "red spinner."

Pale watery
dun and
pale watery
spinner.

| | | |
|---------|-----|--|
| Family | . . | EPHEMERIDÆ |
| Genus | . . | <i>Baëtis</i> |
| Species | . . | { <i>binoculatus</i> <i>scambus</i> |
| Genus | . . | <i>Centroptilum</i> |
| Species | . . | { <i>luteolum</i> <i>pennulatum</i> |

PLATE III

Pale watery dun is a name given indiscriminately to the small pale species of both *Baëtis* and *Centroptilum*, and as with the olive dun the distinctions are not very apparent without calling in the aid of the magnifying glass.



FIG. 5.—Hind wing of *Baëtis binoculatus*, Pale watery spinner.



FIG. 6.—Hind wing of *Centroptilum luteolum*, Pale watery spinner.



FIG. 7.—Hind wing of *Centroptilum pennulatum*, Pale watery spinner.

The *Baëtis* species passing under this name are *binoculatus* and *scambus*, and, as is common to the *Baëtis* group, the hind wings are comparatively broad (Fig. 5).

The *Centroptilum* species are *luteolum* and *pennulatum*. In the former the hind wings are acute at the tips; in the latter these wings are rounded, but not so broad as in *Baëtis* (Figs. 6, 7). The adult forms, the spinners, vary in the colour of the turbinate eyes of the males

PLATE 3.

PALE WATERY DUNS AND SPINNERS

Pale watery dun (male)

Eyes of
Baëtis binoculatus, *B. scambus*, *Centroptilum*
luteolum, *C. pennulatum*

Pale watery spinner
(female)

Pale watery spinner
(male)

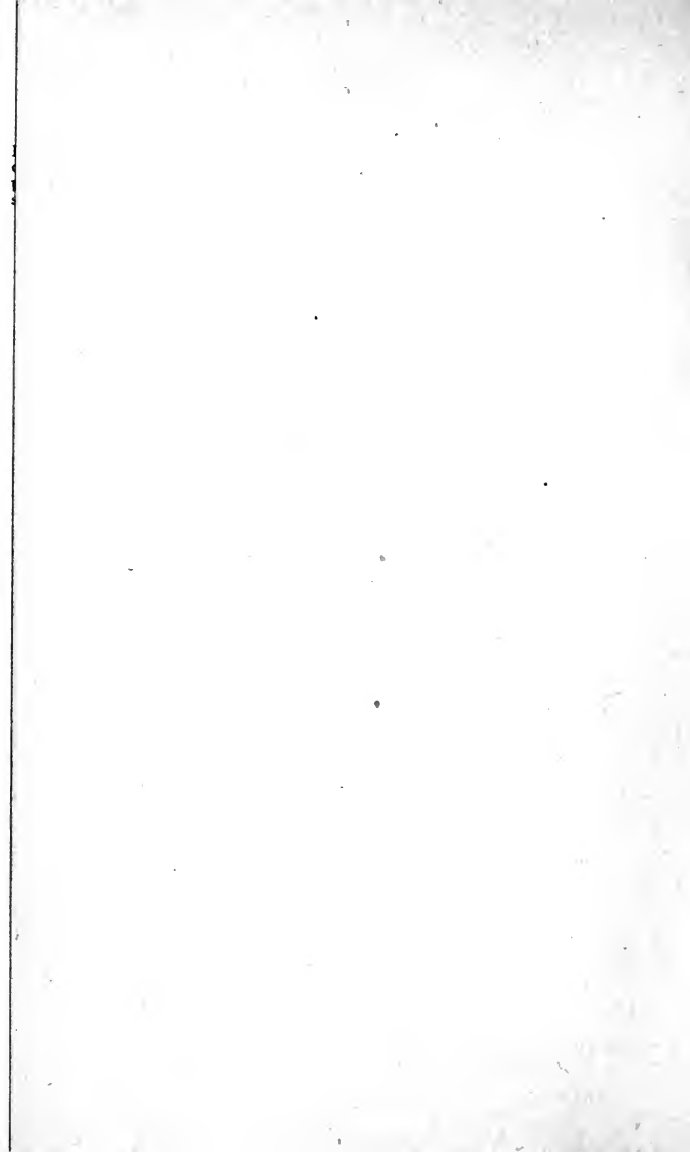
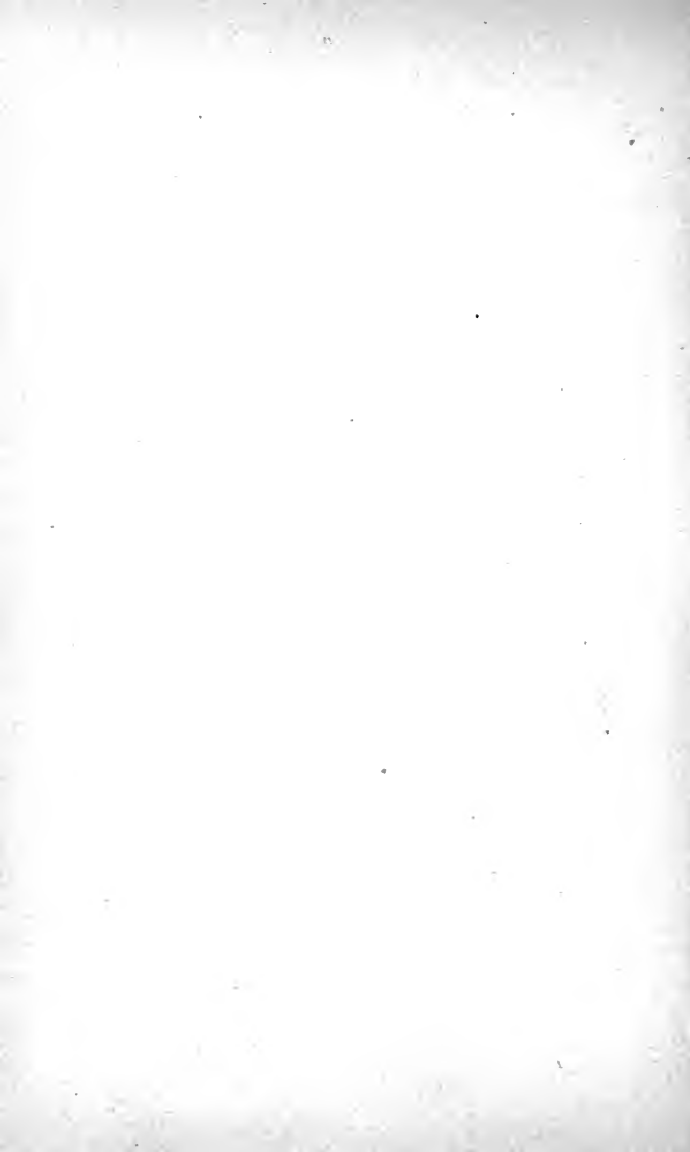


PLATE 3.





according to the species, and as may be seen in Plate III, in *Baëtis binoculatus* the eyes are lemon or bright yellow; in *Baëtis scambus* they are clove or sepia-brown; in *Centroptilum luteolum* they are bright light red; and in *Centroptilum pennulatum* light cadmium-orange. The genus *Baëtis* may be distinguished from *Centroptilum* by the number of lines between the main ner-

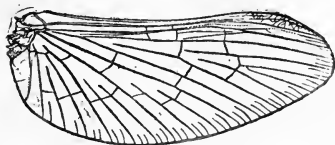


FIG. 8.—Fore-wing of *Baëtis* species.

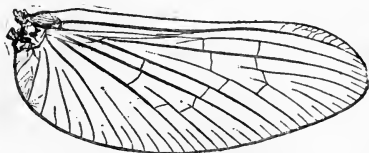


FIG. 9.—Fore-wing of *Centroptilum* species.

vures of the fore-wings. It will be found that there are two such lines in *Baëtis*, and one only in *Centroptilum*. In Figs. 8 and 9, the difference in neuration between the fore-wings of European species of *Baëtis* and *Centroptilum* may be observed.

Iron-blue
dun and
iron-blue
spinners.

| | |
|---------------|------------------|
| Family . . . | EPHEMERIDÆ |
| Genus . . . | <i>Baëtis</i> |
| Species . . . | { <i>pumilus</i> |
| | { <i>niger</i> |

PLATE IV

The appearance of the iron-blue dun is sure of a welcome from the fly-fisher. One of the smallest of the duns, it seems nevertheless to be a favourite with the trout, and one may confidently look forward to a rise when this fly is present in any quantity. I remember one morning on the Kennet watching little droves of olive duns sailing down the broad, smooth river, with here and there an iron-blue interspersed amongst them. A few trout were busily engaged in picking out the iron-blue duns, allowing the olives to sail away unnoticed and untouched.

The autumn iron-blues are smaller than those appearing in the spring. It is suggested that two broods hatch out during the season, the spring flies being the larger. In the plate the iron-blue and jenny spinner are drawn from autumn and spring specimens respectively.

Jenny
spinner.

The male spinner of the iron-blue dun is the pretty little fly known as the jenny spinner, which does not, however, often succeed in tempting the trout to its fate. The female spinner, on the other hand, is a favourite article in the trout's diet, and is a minute insect with a deep reddish-brown body.

PLATE 4.

IRON-BLUE AND CÆNIS

Iron-blue dun (male)
Autumn brood

Cænis halterata spinner
(female)

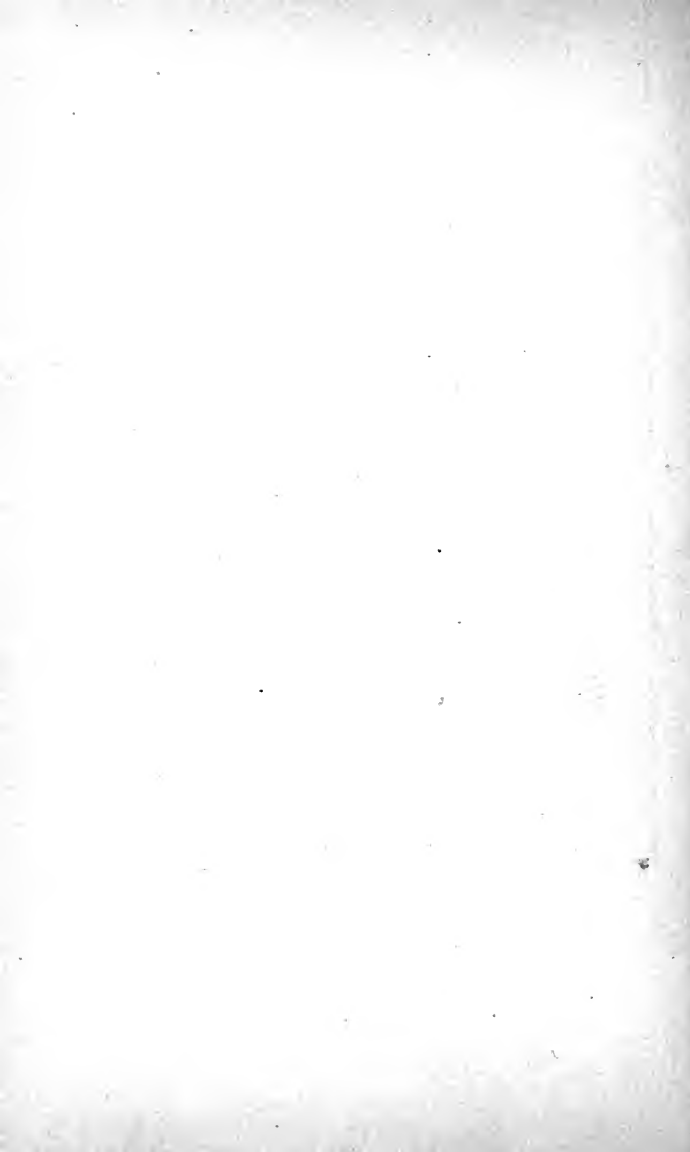
Iron-blue spinner
(female)

Iron-blue spinner (male)
Jenny spinner
Spring brood

PLATE I
THE
PLATE I

PLATE 4.





The two species, *Baëtis pumilus* and *Baëtis niger*, differ from all the other British species of *Baëtis* in having as a rule the intermediate nervure of the hind wing forked, as shown in Fig. 10.

Family . . . EPHEMERIDÆ

Genus . . . *Cænis*

Cænis

Species . . . { *halterata*
harrisella
dimidiata
rivulorum

PLATE IV

I have given on Plate IV a figure of *Cænis halterata*, one of the larger species of *Cænis*, and a fly which does not bear a popular name. A curious feature about the genus is the rapidity with which the change from the sub-imago to the imago takes place. The little sub-imago will settle on one's coat, dig its claws into the fabric, and almost instantly the imago will emerge and fly away to join its fellows, leaving its cast-off clothes behind. Frequently the change takes place actually in the air, and imagines may be seen flying about with the cast-off shucks, like bundles of old clothes, hanging around them in rags and tatters.



FIG. 10.—Hind wing of
Baëtis pumilus.
Iron-blue spinner.

Of the species mentioned above, *dimidiata* and *rivulorum* are extremely minute, and occur

in clouds on warm summer afternoons. *C. halterata* is somewhat larger, and the angler may see the sub-imaginal shucks in thousands attached to walls and fences bordering the river. The specimens in my collection were obtained for me by a keeper at Uxbridge in the very early hours of the morning.

Family . . EPHEMERIDÆ
 Genus . . *Ephemerella*
 Species . . *ignita*

PLATE V

Blue-winged
olive.

A very useful fly to the dry-fly fisherman is the blue-winged olive (*Ephemerella ignita*). It is one of the most abundant of the *Ephemeridæ* on the south-country chalk-streams, and seems to thrive equally well in fast or sluggish waters. It appears on the Test towards the end of June, but on the Kennet and some of its tributaries much earlier in the season. I have seen a capital hatch on the Lambourne as early as mid-April; in the autumn it is a favourite food of swifts and swallows at the time of migration on the Continent.

Sherry
spinner.

The imago is known as the sherry spinner, and the female is noticeable, owing to its curious method of carrying its eggs in a round ball tucked away under the abdomen, and held there in position by the last two or three segments, turned down over a pair of projecting lobes. Mr. Halford, who has likened the flight to that

PLATE 5.

BLUE-WINGED OLIVE AND SHERRY SPINNER
(*Ephemerella ignita*)

Male dun
Blue-winged olive

Male spinner
Sherry spinner

Female spinner in flight
Sherry spinner

Female spinner, spent
Sherry spinner

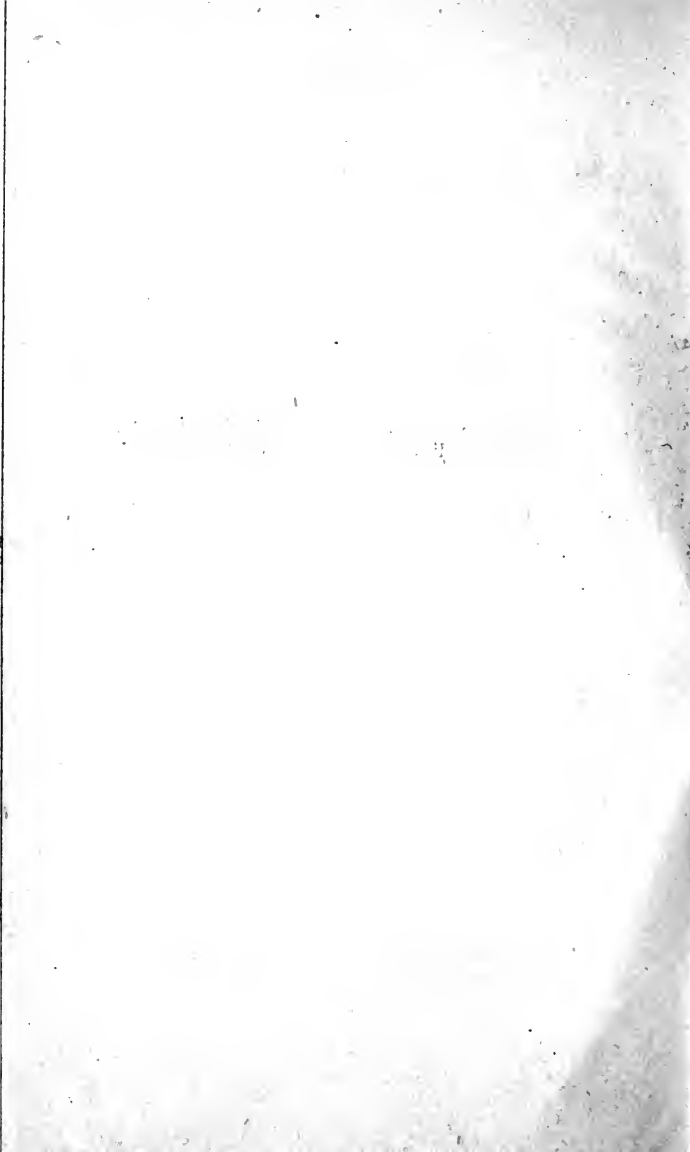
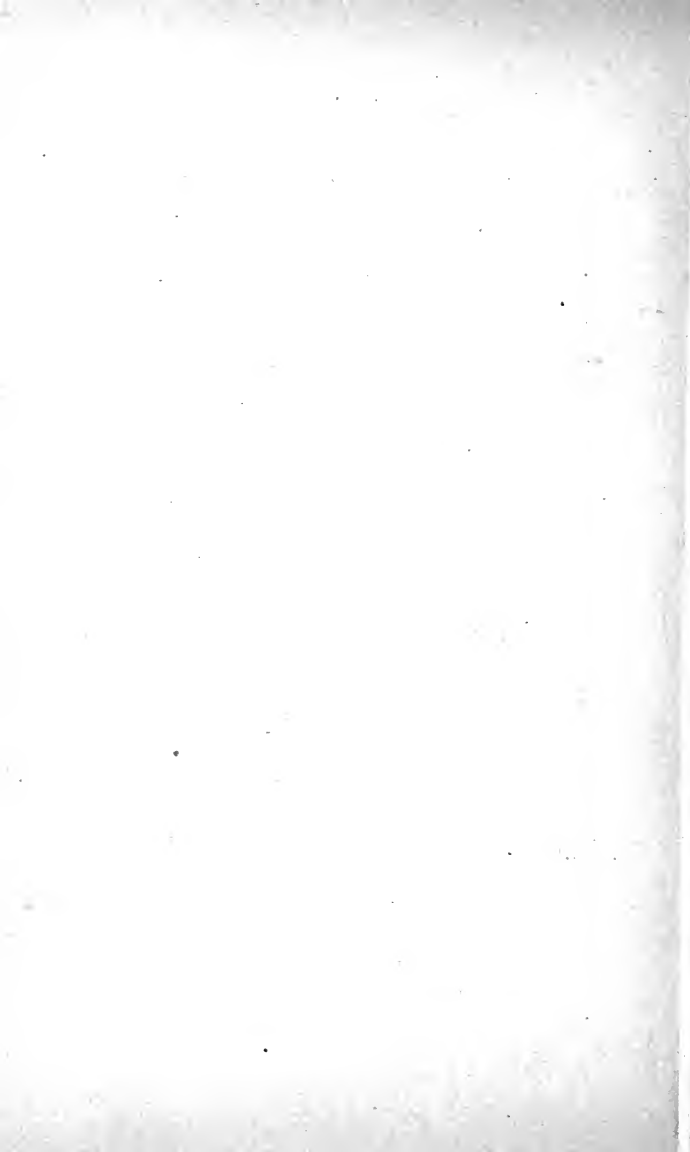


PLATE 5





of a winged ant, writes that the eggs are supported to some extent by the setæ, and Mr. Eaton also states that he has captured the females with the setæ turned under. A most careful observation of female sherry spinners, flying only a few inches from my eyes, showed that the setæ are not always carried in this manner, but that the egg sac may be supported against the lobes by the segments of the body alone, whilst the setæ remain out-

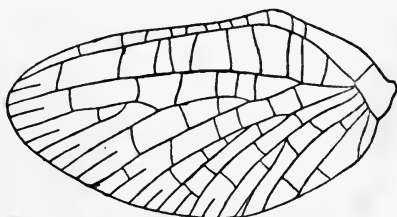


FIG. II.—Hind wing of *Ephemerella ignita*.
Sherry spinner.

stretched. Mr. Eaton has suggested that this position may be assumed at a later stage, after the eggs have been fully extruded. As I am not familiar with the exact position Mr. Eaton and Mr. Halford describe, I figure the position I have myself observed.

Ephemerella ignita is almost unmistakable, owing to the presence of three setæ, distinguishing it from the olive-dun species, which have but two. For further identification I give a figure of the hind-wing. (Fig II.)

| | |
|---------------|-----------------|
| Family . . . | EPHEMERIDÆ |
| Genus . . . | <i>Ecdyurus</i> |
| Species . . . | <i>venosus</i> |

PLATE VI

The march
brown.

The march brown (*Ecdyurus venosus*) is rather a striking-looking fly, on account of

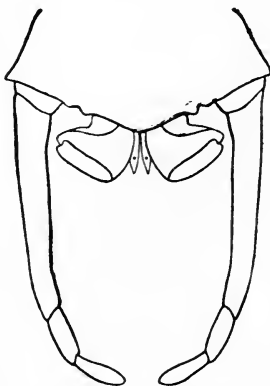


FIG. 12.—Genitalia of
Ecdyurus venosus, ♂.
Great red spinner.

its size and the well-defined marking of its wings. The larva is found under flat stones in rapid streams. So far as I know, the march brown has not yet been observed on the Hampshire chalk-streams, but it occurs in great numbers on some of the northern and western rivers at the beginning of the season. The imago is the great red spinner of Ronald's

Great red
spinner.

"Fly-Fishermen's Entomology." I give a figure of the genitalia of the male (Fig. 12). Closely allied to the march brown, and very similar in the general appearance of its spinner, is the autumn dun,¹ which occurs plentifully on the

¹ I have not yet been able to establish the identity of the autumn dun. It is possible that more than one species has been merged in *Ecdyurus venosus*, and further investigation,

PLATE 6.

ECDYURUS AND HEPTAGENIA

Nymph

Female dun

Male spinner
The great red spinner

Ecdyurus venosus
The march brown

Male dun

Female spinner

Heptagenia sulphurea
The little yellow may dun



PLATE 6.



2.



2.
3.



Dove towards the end of the season. Other species belonging to this group are *Ecdyurus volitans*, which is to be found on the Thames, and *Ecdyurus lateralis*, which differs considerably in appearance from the other species, and superficially resembles *Baëtis rhodani*, one of the olive duns.

Family . . EPHEMERIDÆ
 Genus . . *Heptagenia*
 Species . . *sulphurea*

The yellow
may dun.

PLATE VI

Heptagenia sulphurea is known as the yellow may dun in Great Britain, and the yellow hawk in Ireland. It is allied to the march brown in that the larvæ of both belong to the group which Pictet, the eminent Swiss entomologist, described as "*Flat larvæ*," which term expresses the broad, squat appearance of the immature insect when clinging to the underside of stones and rocks.

The yellow may dun occurs abundantly on the Hampshire chalk-streams "hatching out" as evening advances, though the fly may also be seen during the daytime. Of a brilliant sulphur hue, with metallic-looking dark eyes, *H. sulphurea* is one of the handsomest of the EPHEMERIDÆ. Nevertheless, it is possibly of

specialty directed to the sub-imago and the nymph, may prove the necessity of creating a new species to receive this fly. The male genitalia are practically indistinguishable from those of the march brown.

little value to the fisherman, and Mr. Halford states that he has never yet found it in the autopsies of fish he has killed on the Test or Itchen.

The imago is apt to be confused with another insect, *Rhithrogena semicolorata*, which it greatly resembles. The latter insect may be distinguished by what Mr. Eaton calls a "submedian, triangular, longitudinal black streak" on the femora. The imago is often described as the yellow upright, and is extremely plentiful on many streams other than chalk-streams.

Family . . . EPHEMERIDÆ
 Genus . . . *Leptophlebia*
 Species . . . *submarginata*

PLATE VII

The turkey brown (*Leptophlebia submarginata*) is sometimes confused with the march brown, although much smaller, especially if one of its three setæ has been accidentally broken off. Usually, however, the magnifying glass will reveal the broken stump. The subimago is a prettily marked insect, the wings being shaded with dark brown or fawn colour. It does not seem to be much appreciated by the trout. The female imago is a handsome fly with a rich plum-coloured body.

Closely allied is *Leptophlebia vespertina*, which is known as the claret dun in Ireland, and occurs mainly on still waters, though it has been

Rhithrogena semicolorata.

Yellow upright.

Turkey brown.

Leptophlebia vespertina, the claret dun.

PLATE 7.

LEPTOPHLEBIA SPECIES

Female dun

Male spinner

Leptophlebia submarginata
The turkey brown

Turkey brown spinner
(female)

Leptophlebia vespertina
(female dun)
The claret dun



PLATE 7.



found on slow-running streams. The smoky-blue wings of the sub-imago readily distinguish it from its near relation, the turkey brown, but the imagines are difficult to separate without the microscope. It has been taken in numbers on Lough Arrow, and a specimen was once sent me by Mr. E. A. Ferry from the Itchen. I have taken it myself on the Dever, a small tributary of the Test, and here it is found on a very slow-running portion of the stream above a mill. A figure of the claret dun is given on Plate VII.

Another species of this genus is *Leptophlebia marginata*. It resembles the turkey brown, but the wings are not so heavily shaded. I have found it very plentifully on Loch Tummei during the early part of the season, and have taken a single example on the Test.

Lepto-
phlebia
marginata.

PART III

THE TRICHOPTERA

A CONSIDERABLE space has been devoted in this book to the TRICHOPTERA, or caddis-flies, as the group is a large one and the angler will meet with many species during the hours he spends by the water-side. For the purpose of classification, McLachlan has ranked the group as an Order.

Phryganea grandis and
Phryganea striata.

Family . . . PHRYGANEIDÆ
Genus . . . *Phryganea*
Species . . . *grandis* and *striata*
Spurs, 2.4.4.

PLATE VIII

The large
red sedge.

Phryganea grandis and *Phryganea striata* are the largest of the British caddis-flies, the female insects being veritable monsters, measuring nearly two inches across the wings. Nocturnal in their habits, both species occur on most of the south-country streams, and pass indiscriminately under the popular name, the large red sedge. They are found on various rivers and lakes in the north and in Ireland,

PLATE 8.

CADDIS FLIES

The Large Red Sedge

Phryganea striata
(female)

Phryganea grandis
(male)

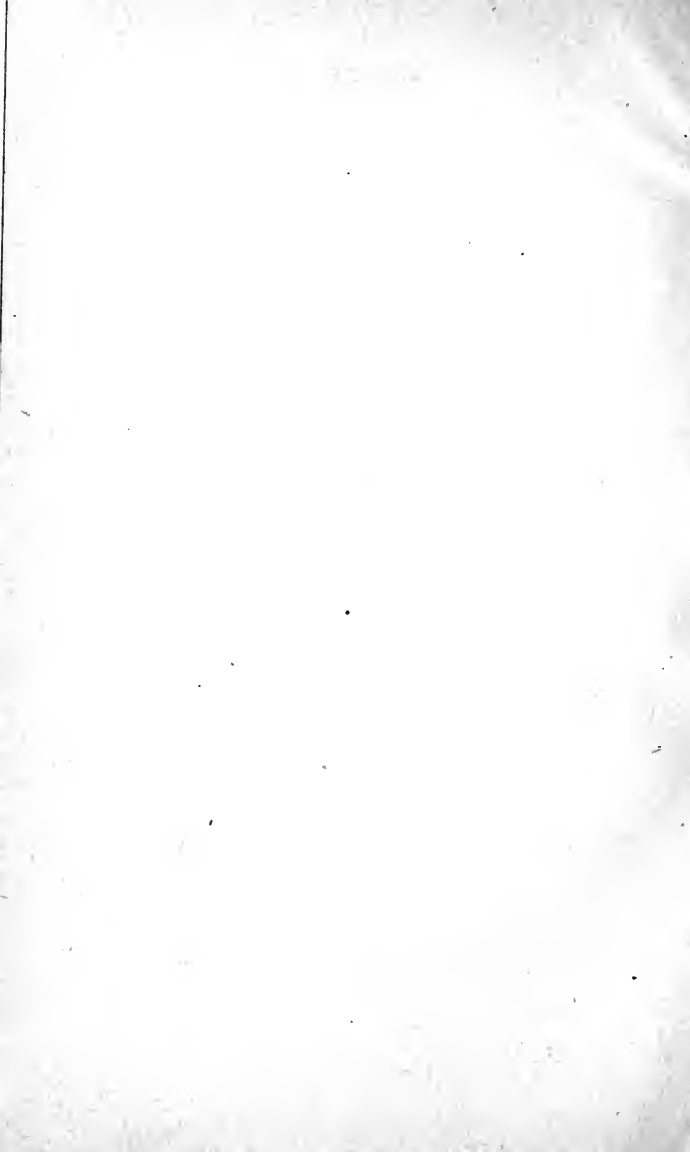


PLATE 8.



where the female of either species is known as the "murraugh."

Phryganea striata appears late in the evening flying rapidly over the water close to the sedge-lined banks. At Uxbridge, on the Colne, I have taken *striata* just at dusk, and then, when

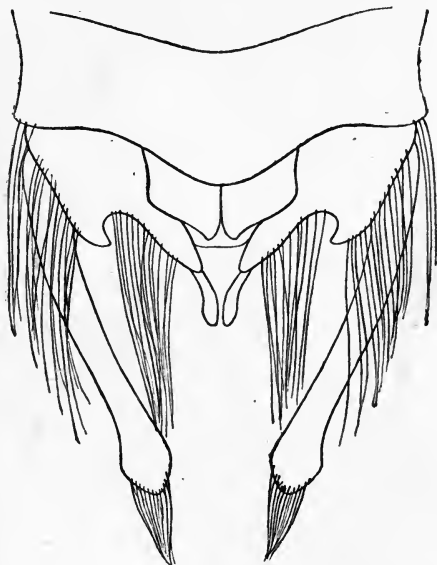


FIG. 13.—Genitalia of *Phryganea striata*, ♂, from above.

almost dark, *grandis* has issued forth. The two species may be readily separated by the form of the male genitalia, of which outlines are given in Figs. 13 and 14 respectively. The larvæ make cases entirely of vegetable matter.

Phryganea varia, *obsoleta*, and *minor*.

Other species belonging to this genus are *varia*, a prettily marked insect, which has been sent to me from Lough Arrow in Ireland;

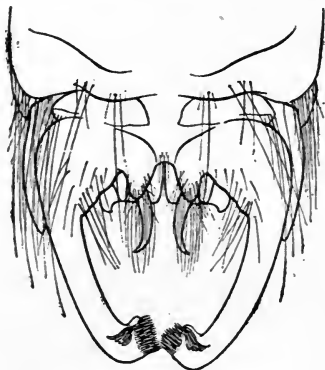


FIG. 14.—Genitalia of *Phryganea grandis*, ♂, from above.

obsoleta, from the neighbourhood of Blaenau Festiniog; and *minor*, a comparatively small insect, from the New Forest.

Family . . . LIMNOPHILIDÆ

Genus . . . *Limnophilus*

Species . . . *lunatus*

Spurs, 1.3.4.

PLATE IX

Limnophilus lunatus, the cinnamon sedge.

Limnophilus lunatus, the cinnamon sedge, is one of the more abundant species of *Limnophilus*, and occurs in fair numbers on the Hamp-

PLATE 9.

CADDIS FLIES (LIMNOPHILIDÆ)

Limnophilus lunatus
Caddis case

Limnophilus flavicornis
Caddis case

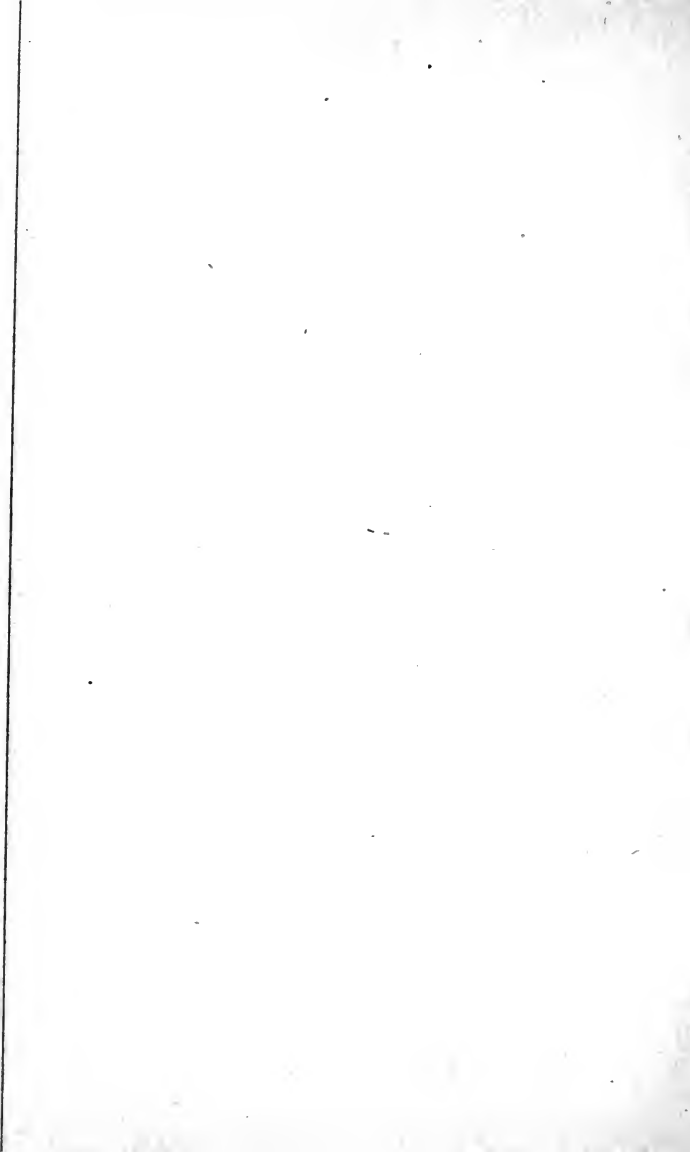
Limnophilus lunatus
(female)
The cinnamon sedge

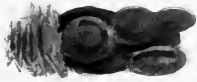
Halesus radiatus
(female)
The caperer

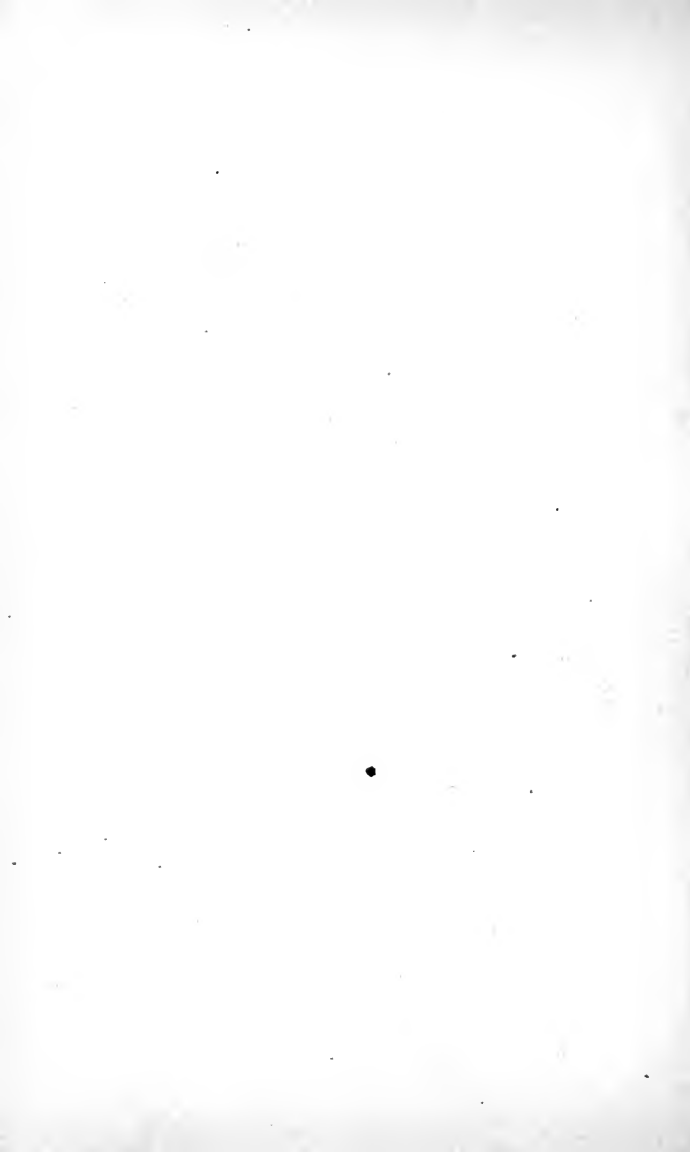
Chætopteryx villosa
(female)

Anabolia nervosa
(male)

Stenophylax stellatus
(female)







shire chalk-streams. As may be seen in the plate, it is a prettily marked insect with a well-defined lunate patch towards the extremity of the anterior wings. The male insect has a green body, but that of the female is brown. The caddis case of the larva is usually composed

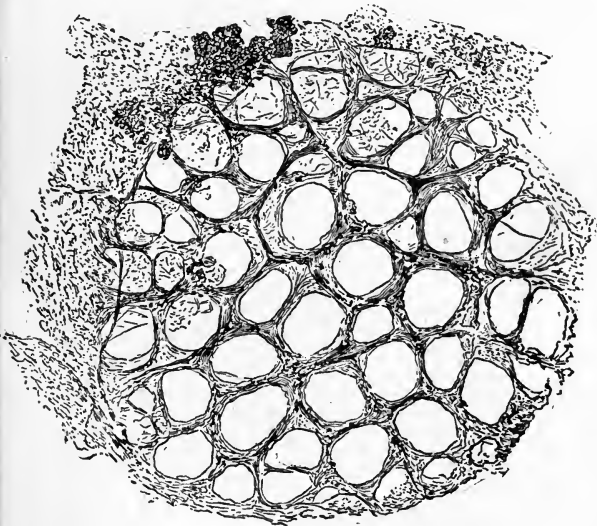


FIG. 15.—Pupal grating of *Limnophilus lunatus*.

of pieces of broken shells, and the figure here given has been drawn from a caddis which was reared in my aquarium, in which the soil covering the bottom was composed of a variety of material. The grating made by the larva for the purpose of sealing the caddis case when

about to pupate, varies very considerably in the method of construction from that made by species of other families, notably the *Sericostomatidæ*, and I show this grating in Fig. 15. *Limnophilus rhombicus*, another species in the same

Limnophilus
rhombicus.

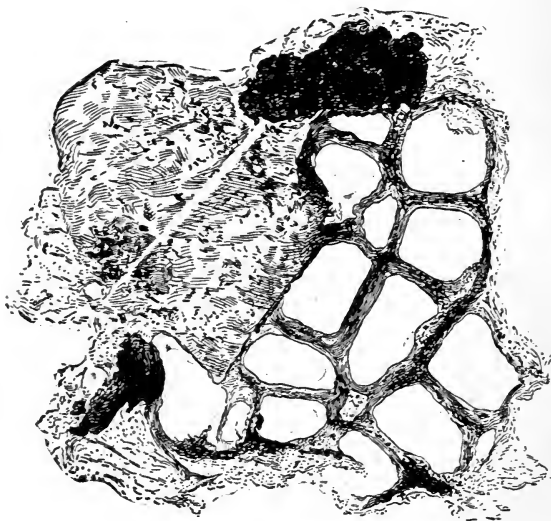


FIG. 16.—Pupal grating of *Limnophilus rhombicus*.

genus, makes a grating very similar in design, shown in Fig. 16, and I have little doubt that further investigation will prove that most, if not all, species of a particular genus make gratings on the same general plan.

Family . . . LIMNOPHILIDÆ
 Genus . . . *Anabolia*
 Species . . . *nervosa*
 Spurs, I.3.4.

PLATE IX

Towards the end of the season a brownish *Anabolia nervosa*, may be found in con-
Anabolia nervosa.

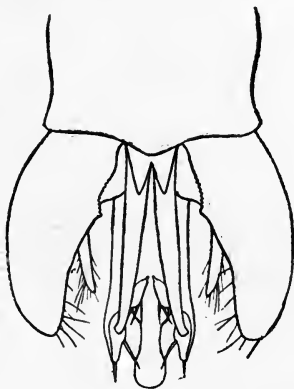


FIG. 17.—Genitalia of *Anabolia nervosa*, ♂, from above.

siderable abundance during the daytime fluttering about the reeds and sedges lining the river-bank. As frequently happens amongst the caddis-flies, these insects seem to occur in two distinct sizes, but a minute examination has not as yet shown any structural difference between them. I give a drawing of the genitalia of the male in Fig. 17.

Family . . . LIMNOPHILIDÆ

Genus . . . *Chætopteryx*

Species . . . *villosa*

Spurs, male, 0.3.3; female, 1.3.3.

PLATE IX

Chætopteryx villosa.

Chætopteryx villosa is one of the last of the caddis-flies that the angler will see during the

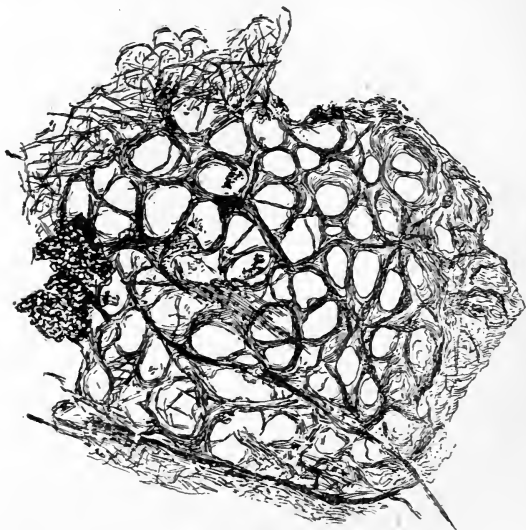


FIG. 18.—Pupal grating of *Chætopteryx villosa*.

trout season. It appears towards the end of September, and is to be found by the water-side during October and November, and even in December. An interesting character, referred

to in an earlier chapter, is the difference in the number of spurs present in the two sexes, the male having one less than the female on the anterior tibæ.

This fly will be easily recognised by the very hairy appearance of the wings, which literally bristle with long stiff hairs. It is subject to great variety in size, and the larva makes a rough case of miscellaneous material. I give a figure of the pupal grating, which has a character of its own, though akin in construction to those of *Limnophilus lunatus* and *rhombicus*. This is to be expected, as all three belong to one family. The reader should note how widely the grating differs from the pattern made by members of the *Sericostomatidæ* group.

Family . . . LIMNOPHILIDÆ
 Genus . . . *Halesus*
 Species . . . *radiatus*
 Spurs, 1.3.3.

PLATE IX

This insect is the caperer of the trout fisherman, and is a large, strikingly marked fly not likely to be confused with any but the closely allied species *Halesus digitatus*. So nearly alike are these two that the popular name can quite legitimately be applied to both species. On the Test *H. digitatus* is not so abundant as *H. radiatus*; it is somewhat larger, and has slightly

Halesus radiatus,
the caperer.

Halesus digitatus.

pointed anterior wings. There are, besides, important differences in the structure of the genitalia.

The caperer is very abundant, late in the season, coming out of its hiding-places at dusk. The larva makes a short, thick case roughly covered with stones.

Family . . . LIMNOPHILIDÆ

Genus . . . *Stenophylax*

Species . . . *stellatus*

Spurs, 1.3.4.

*Stenophylax
stellatus.*

PLATE IX

Towards the end of July, and continuing through August into September, a large brown sedge appears in very great numbers just as it gets dark. If a collecting net be swept through the rushes and sedge by the river-side, it will usually be found to contain five or six of these big caddis-flies running up the side



FIG. 19.
Genitalia of *Stenophylax stellatus*,
 δ , from the
side.

This is *Stenophylax stellatus*, and I think it may be recognised by the figure on the plate and the drawing of the male genitalia given in Fig. 19.

Family . . . SERICOSTOMATIDÆ
 Genus . . . *Sericostoma*
 Species . . . *personatum*
 Spurs, 2.2.4.

PLATE X

Sericostoma personatum is known in Hampshire as the welshman's button, and is one of the day-flying sedges. As a general rule it appears in such abundance as to prove a worthy substitute for the mayfly where this insect has become too scarce to bring the big fish up to feed. The reddish-mahogany colour observed when the insect "hatches" up through the water and flops about on the surface, rapidly darkens with age and exposure to light and air, and the flies seen on the grass and sedges are usually of a deep chestnut-brown. The female is variable in its coloration, and frequently exhibits white patches on the wings. These patches are so uniform where they occur at all that McLachlan has classified the flies bearing them as varieties. *Sericostoma multiguttatum* Varieties. he describes as being variegated with hoary pubescence which in *S. analis* is almost reduced to a triangular spot at the termination of the seventh apical sector.

It should be observed that these variations only occur in the female sex.

The abnormal maxillary palpi of the male

form a very striking feature of the welshman's button, and are shown in Fig. 20, whilst the male genitalia appear in Fig. 21.



FIG. 20.—Head of *Sericostoma personatum*, ♂ (welshman's button); M, maxillary palpi; L, labial palpi.



FIG. 21.—Genitalia of *Sericostoma personatum*, ♂, (welshman's button) from the side.

I also give a drawing of the grating with which the larva seals each extremity of its case when about to pupate. The half-moon shaped apertures allow ingress and egress to the water,

PLATE 10.

CADDIS FLIES (SERICOSTOMATIDÆ)

Sericostoma personatum
Caddis

Sericostoma personatum
(male)
The welshman's button

Notidobia ciliaris
(male)

Goëra pilosa
(female)

THE
MUSEUM OF
ART AND HISTORY

PLATE IO





and the surrounding substance seems to be made of a fine sand glued into a fairly hard plate (Fig. 22).

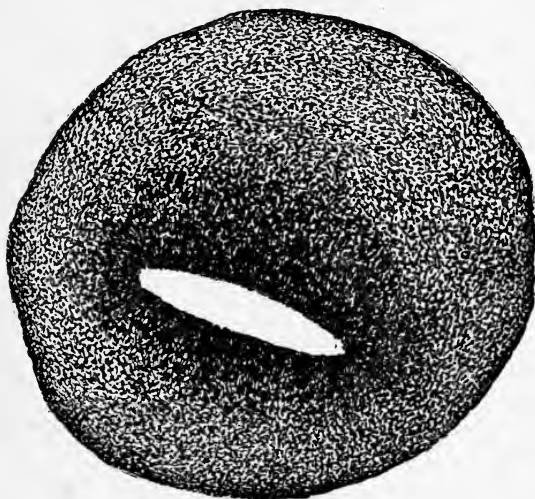


FIG. 22.—Pupal grating of *Sericostoma personatum*,
The welshman's button.

Family . . . SERICOSTOMATIDÆ
 Genus . . . *Notidobia*
 Species . . . *ciliaris*
 Spurs, 2.2.4.

PLATE X

Notidobia ciliaris is a black caddis-fly com-
 mon on most rivers, and closely akin to *Serico-*
stoma personatum. This is evidenced both by

Notidobia
ciliaris.

the form of the genitalia of the male, shown in Fig. 23, and also by the caddis case, which not only resembles that of *Sericostoma* so closely as to be almost indistinguishable, but is also furnished with a pupal grating which seems to be exactly similar in general design and struc-

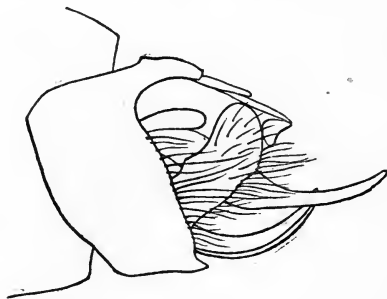


FIG. 23.—Genitalia of *Notidobia ciliaris*, ♂, from the side.

ture, both case and gratings being built on a slightly smaller scale.

The female may frequently be seen carrying a bunch of bright yellow eggs, and any one who cares to take the trouble can very easily rear this insect to maturity by dropping the eggs into a bowl of water, putting in plenty of fine gravel and sand to provide material with which the caddis may make and enlarge its case. The period of development from the egg to maturity is roughly twelve months.

Family . . . SERICOSTOMATIDÆ
 Genus . . . *Goëra*
 Species . . . *pilosa*
 Spurs, 2.4.4.

PLATE X

Goëra pilosa is a yellowish-brown caddis-fly Goëra pilosa
 which occurs plentifully on most chalk-streams
 throughout the summer. The maxillary palpus

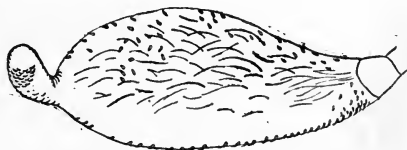


FIG. 24.—*Goëra pilosa*, ♂. Maxillary palpus.

of the male is so peculiarly formed that I give a drawing of it in Fig. 24.

The male insect is further characterised by a coronet of strong spines on the sixth ventral segment. The genitalia are shown in Fig. 25.

Family . . . SERICOSTOMATIDÆ
 Genus . . . *Silo*
 Species . . . *nigricornis*
 Spurs, 2.4.4.

Silo nigricornis is a very dark brown, rather Silo nigri-
cornis.
 small insect, fairly plentiful on most trout
 streams. Like the previous species, it carries

a coronet of spines on the sixth ventral segment. The maxillary palpi are short, hairy, and upturned, and the genitalia are shown in

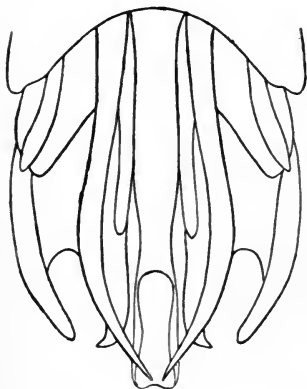


FIG. 25.—Genitalia of *Goëra pilosa*, ♂, from above.

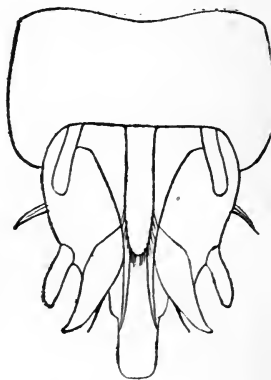


FIG. 26.—Genitalia of *Silo nigricornis*, ♂, from above.

Fig. 26. A fly very similar in general characters but still smaller is *Silo pallipes*, which occurs plentifully on the Dove and other rivers.

Silo pallipes.

Family . . . SERICOSTOMATIDÆ
Genus . . . *Brachycentrus*
Species . . . *subnubilus*

Spurs, 2.3.3.

PLATE XI

The grannom (*Brachycentrus subnubilus*) is a fly of value to the trout fisherman, partly in tempting big fish to come to the surface, but

Brachycentrus subnubilus, the grannom.

PLATE 11.

THE GRANNOM (*Brachycentrus subnubilus*)

Egg sac

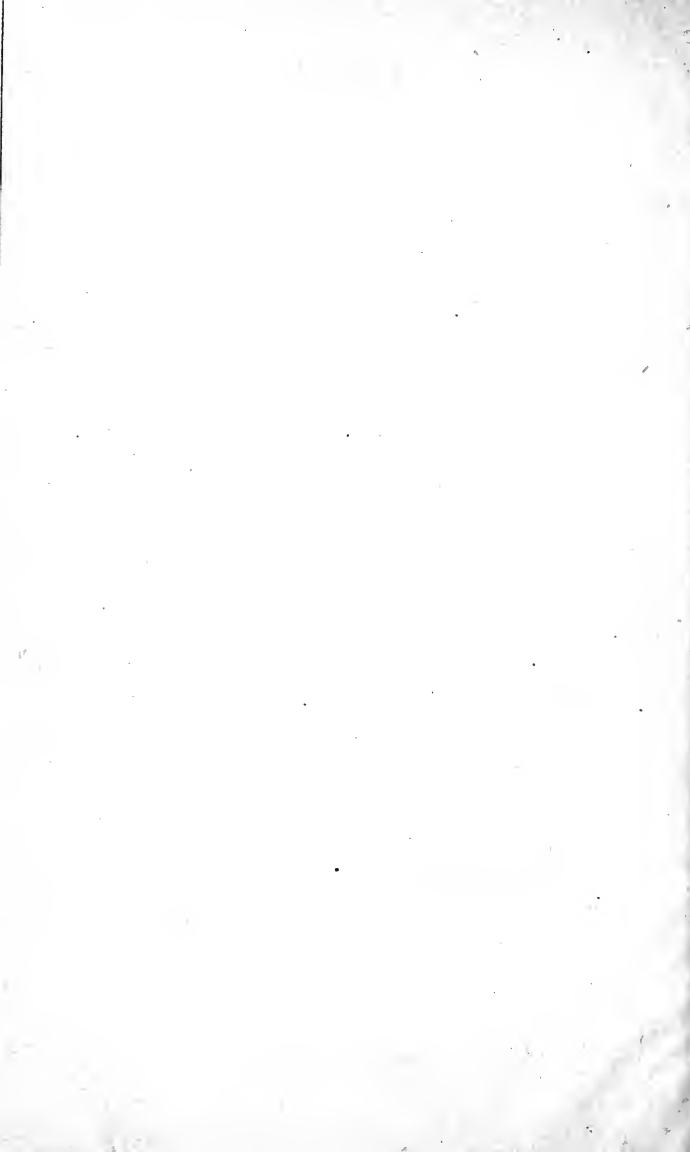
Sacs expanded

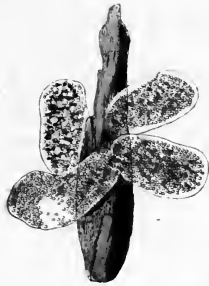
Young larvæ

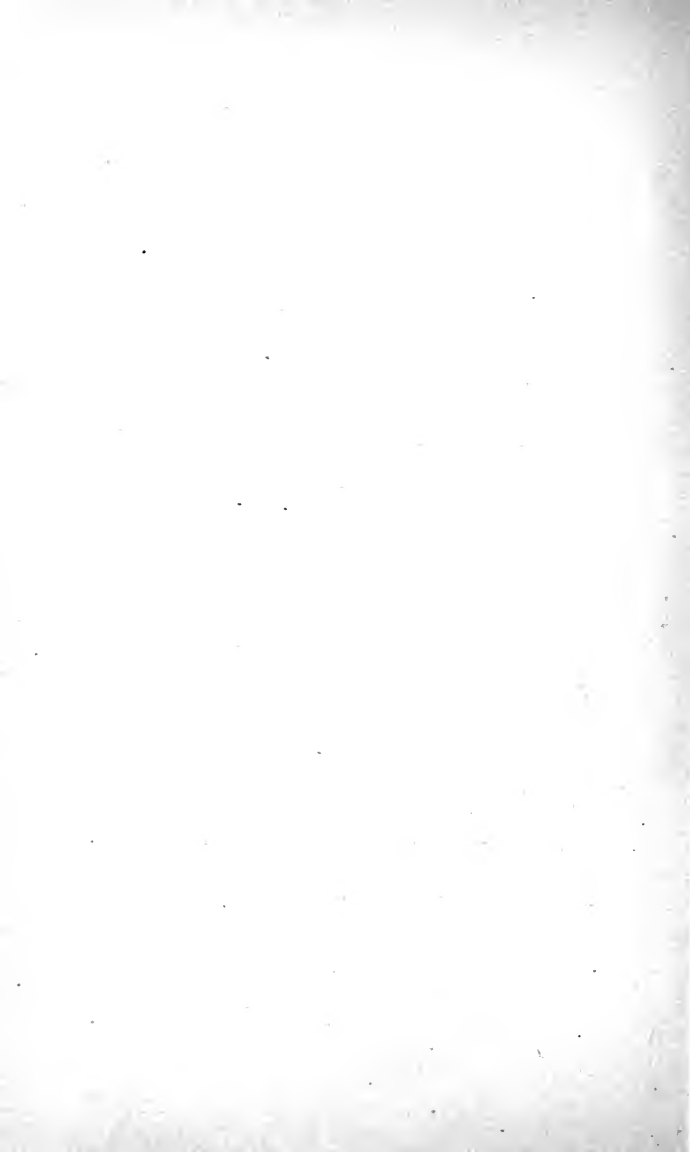
Larvæ nearly full grown

Pupal case

Female, with egg sac







chiefly in providing an immense quantity of food for the trout at the season when they require it most—*i.e.* quite early in the spring in south-country streams. It goes without saying that the fish feed freely on it in all its stages—larva, nymph, and winged. On some rivers, notably the Kennet, the grannom makes its appearance towards the middle of April in extraordi-

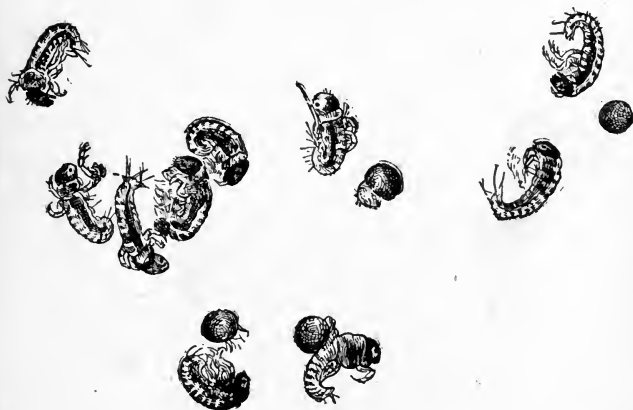


FIG. 27.—Larvæ of *Brachycentrus subnubilus* (grannom) emerging from the eggs, from a microscope preparation.

nary abundance, and on this river I have seen the water covered from bank to bank with the discarded pupal shucks. On the Tummel in the Scottish Highlands the fly is not so early, and may be expected towards the end of May or even the beginning of June.

The artificial pattern is usually a copy of the female insect, which, towards the period

56 OVIPOSITION OF THE GRANNOM

of oviposition, carries at the oviducts an oval bunch of bluish-green eggs enveloped in a gelatinous substance which adheres to the weeds and stones, and expands considerably on contact with the water. This egg mass is lodged in a cavity formed by the turning inwards of the last two or three segments of the abdomen.

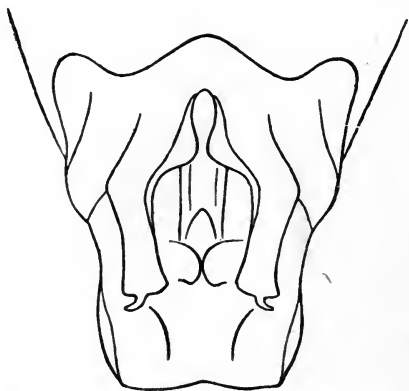


FIG. 28.—Genitalia of *Brachycentrus subnubilus*, ♂ (grannom), from beneath.

The female, when the eggs are fully extruded, probably descends into the water to deposit them by climbing down some post or weed stem, and possibly never rises to the surface again. I do not remember ever having captured or seen a female voided of eggs, and in my aquarium I have found individuals attached to the weed several inches below the surface of the water, and quite dead.

The first act of the larva on emerging from the egg is to make itself a case, quadrilateral in shape, and composed of vegetable matter. Some I bred in a glass jar containing neither weed nor river soil made their first cases of the discarded egg skins, *faute de mieux*. I give

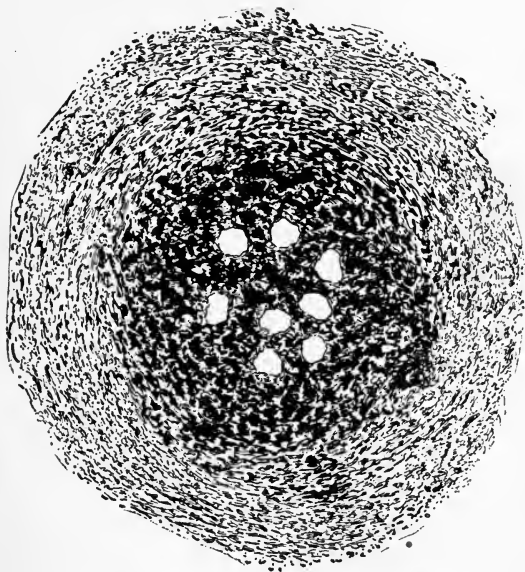


FIG. 29.—Pupal grating of *Brachycentrus subnubilus*.
The grannom.

an illustration of a group of larvæ just emerged or emerging from the eggs in Fig. 27, and the male genitalia of the adult fly are shown in Fig. 28. I also give a figure of the pupal

grating, which differs in form from that of *Sericostoma* and *Notidobia*, but is closely akin in the nature of the material used and the general plan of the perforated plate (Fig 29).

Family . . . SERICOSTOMATIDÆ

Genus . . . *Lepidostoma*

Species . . . *hirtum*

Spurs, 2.4.4.

*Lepidostoma
hirtum.*

Sometimes mistaken for the grannom is the allied insect *Lepidostoma hirtum*. The caddis case is also quadrilateral and made of vege-

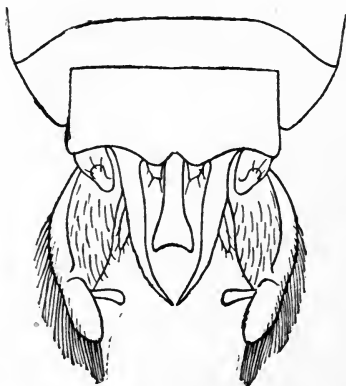


FIG. 30.—Genitalia of *Lepidostoma hirtum*, ♂, from above.

table matter. The shape is, however, much more decided, and the case is longer and more tapering. The female also carries a bunch of green

eggs, but this egg mass is rounded, and the insect itself bears little resemblance to the grannom, besides differing in the spur formula.

I give a figure of the male genitalia, which show a further difference in the arrangement of the various sexual organs (Fig. 30). *Lepidostoma hirtum* occurs much later in the season, on the Test about August or September.

Family . . . ODONTOCERIDÆ
 Genus . . . *Odontocerum*
 Species . . . *albicorne*
 Spurs, 2.4.4.

PLATE XII

McLachlan placed *Odontocerum albicorne* in the family of the LEPTOCERIDÆ, but states that the genus is highly specialised, and that he had seen no extra European form. He suggests that it might well be removed from the *Lepto-*

Odontocerum albicorne.
 Grey sedge.



FIG. 31.—*Odontocerum albicorne*, ♂, portion of antenna, highly magnified.

ceridæ, and Ulmer has adopted his suggestion. It is a large, greyish caddis-fly with stout, white, toothed antennæ, from which the name is derived, and is a striking-looking insect, quite common both on the Test and the Dove. The antennæ are so peculiar in appearance that I

give a drawing of a portion of one of them, much enlarged. It will be seen that the toothed appearance is due to the presence and arrangement of strong hairs arising from a slight swelling towards the middle of each joint (Fig. 31).

Family . . . LEPTOCERIDÆ
 Genus . . . *Leptocerus*
 Species . . . *cinereus*
 Spurs, 2.2.2.

PLATE XII

Leptocerus
cinereus,
 brown
 silverhorns.

Leptocerus cinereus is the brown silverhorns of the trout fisherman, and is abundant on

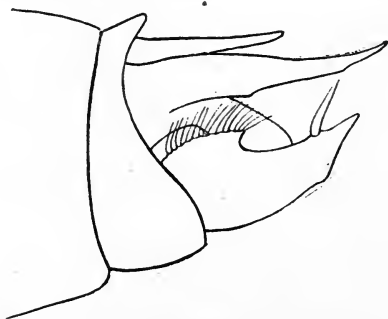


FIG. 32.—Genitalia of *Leptocerus cinereus*, ♂, from the side.

most rivers. On the Thames it occurs in countless numbers, and on still summer evenings may be seen across the river from bank to

PLATE 12.

CADDIS FLIES

Odontocerum aliborne (female)
The grey sedge

Leptocerus cinereus (male)
The brown silverhorns

Mystacides azurea
(male)
The black silverhorns

Mystacides longicornis
(male)
The grouse wing

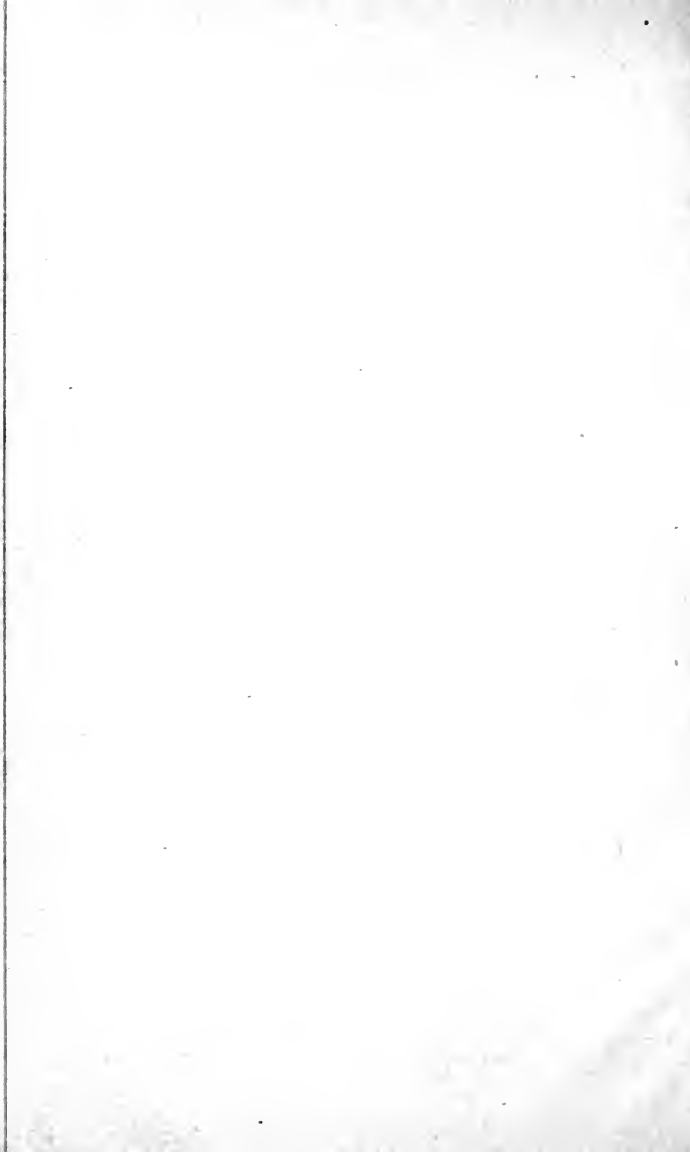
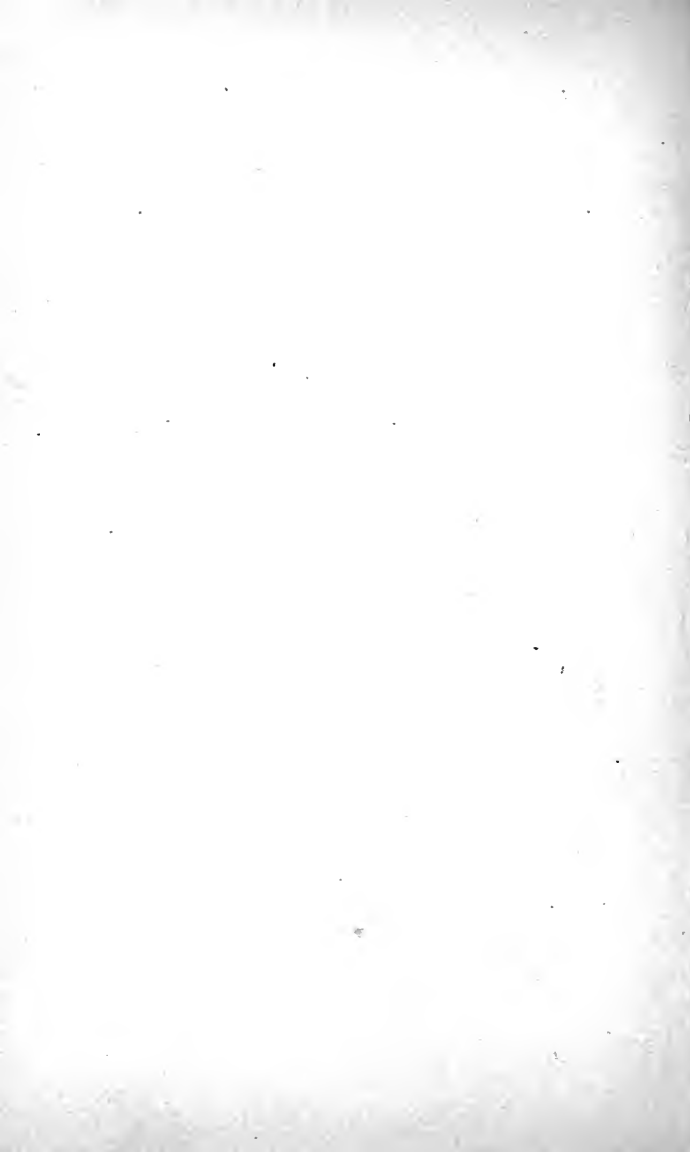


PLATE I2





bank. The flight of the silverhorns is characteristic and takes the form of a rapid approach right up to the bank, followed by an equally rapid departure, progress being made up stream or down during the performance of these evolutions. The male genitalia are shown in Fig. 32.

Another species of *Leptocerus* occurs very plentifully on the Test, namely, *Leptocerus albifrons*, which is chocolate in colour with white markings, and probably also passes under the popular name brown silverhorns. Leptocerus albifrons.

Family . . . LEPTOCERIDÆ
 Genus . . . *Mystacides*
 Species . . . *azurea*
 Spurs, 0.2.2.

PLATE XII

Mystacides azurea is one of three caddis-flies passing under the name of black silverhorns, the other two being *Mystacides nigra* and *Leptocerus aterrimus*. Mystacides azurea, black silverhorns.

When at rest, the long hairy palpi are bent round towards each other, and pressed against the sedge on which the insect has settled, giving it somewhat the appearance of being in possession of a fourth pair of legs. The wings are of a deep metallic blue colour, with an apparent incision in the upper and lower edges of the anterior wings, which allows of the extreme ends being somewhat turned inwards. An

interesting character of the genus is the presence of a row of minute hooks attached to the

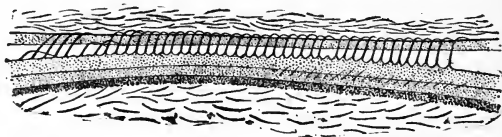


FIG. 33.—Hooks connecting the anterior and posterior wings of *Mystacides nigra*.

upper edge of the posterior wing towards the extremity, and fitting into a groove in the anterior wings. This is illustrated in Fig. 33.

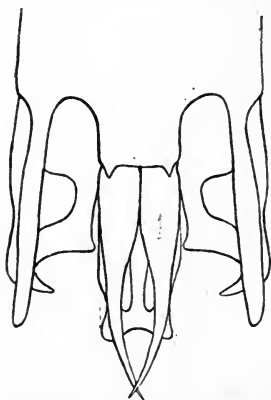


FIG. 34.—Genitalia of *Mystacides nigra*, ♂, from above.

It is probable that the hooks lock the wings together when the insect is flying, and give extra sustaining power to these active little flies. These hooks are not confined to *Mystacides*, but occur in many other genera both European and extra-European.

The male genitalia of *Mystacides nigra* are shown in Fig. 34.

| | | |
|---------|-----|--------------------|
| Family | . . | LEPTOCERIDÆ |
| Genus | . . | <i>Mystacides</i> |
| Species | . . | <i>longicornis</i> |
| | | Spurs, 0.2.2. |

PLATE XII

Mystacides longicornis is known in the north as the grouse-wing, from the close resemblance that the colours and markings of the wings bear to some of the grouse feathers. It frequents still waters, such as canals and reservoirs, and in such localities occurs in considerable abundance towards August and September. I have found it on the canal at Newbury, on the Hythe military canal, on some ponds at Great Missenden, and on a lake in the immediate neighbourhood of the Test.

Mystacides longicornis,
grouse-wing.

| | | |
|---------|-----|---------------------|
| Family | . . | HYDROPSYCHIDÆ |
| Genus | . . | <i>Hydropsyche</i> |
| Species | . . | <i>instabilis</i> . |
| | | Spurs, 2.4.4. |

PLATE XIII

Hydropsyche instabilis belongs to a group of caddis-flies which come out of their hiding-places in bright weather and dance about in clouds in the sunlight. The eaves of fishing-huts form favourite places for such gatherings. During May and June numbers of two other species, *H. guttata* and *H. pellucidula*, are usually to be seen, the last named being the

Hydropsyche instabilis.

largest of the three, and *guttata* perhaps the most abundant on the Test. I show the geni-

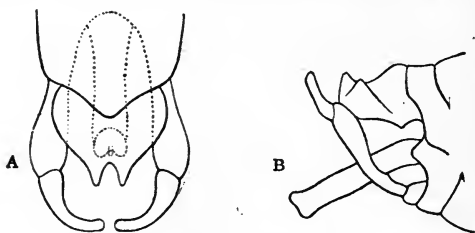


FIG. 35.—Genitalia of *Hydropsyche guttata*, ♂.
A. from above. B. from the side.

talia of this last-named fly in Fig. 35, and the neuration of the wings is illustrated in Fig. I on p. II.

Family . . . POLYCENTROPIDÆ
Genus . . . *Polycentropus*
Species . . . *flavomaculatus*
Spurs, 3.4.4.

Polycentropus flavomaculatus.

A description is given with a drawing of the genitalia of this little caddis-fly, on account of its great abundance in almost every river. Quite small, it is very active, and runs about during the daytime up and down the stems of grasses by the edge of the water. The wings are dark brown spotted with gold, and the thorax is densely clothed with light-coloured hairs. The male genitalia are shown in Fig. 36. Other species belonging to this genus are *kingi* and *multiguttatus*.

PLATE 13.

CADDIS FLIES

Pupal case

Larva

Pupa

Female

Rhyacophila dorsalis

Philopotamus montanus
(female)

Hydropsyche instabilis
(female)

Chimarra marginata
(female)

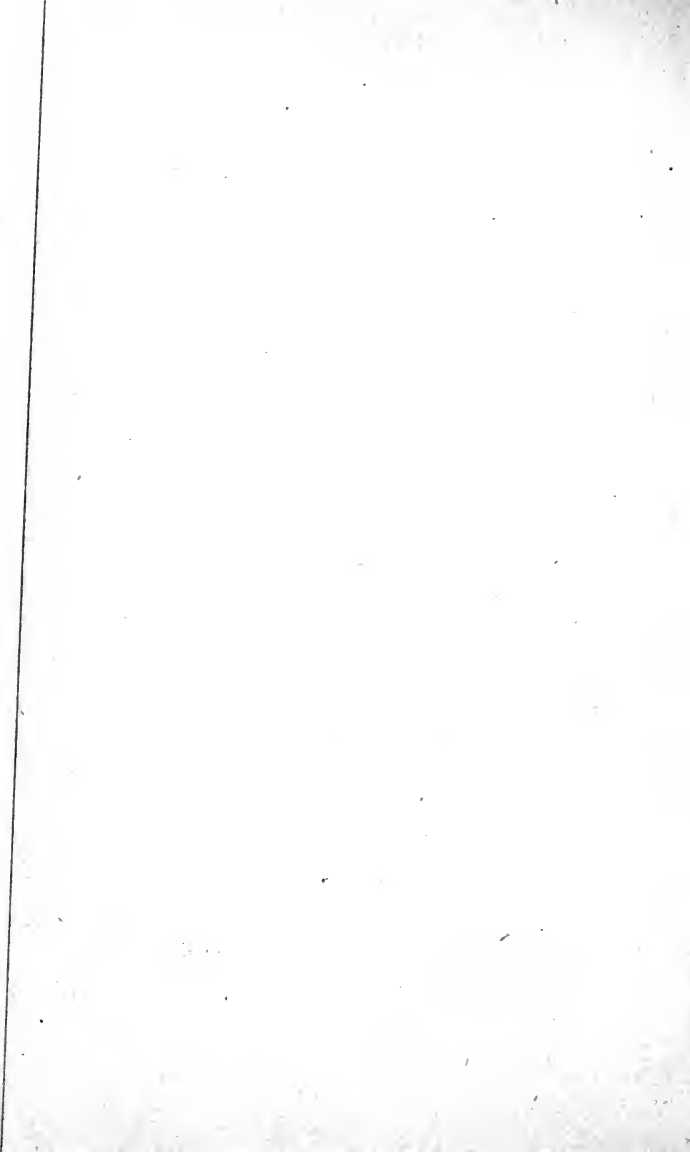
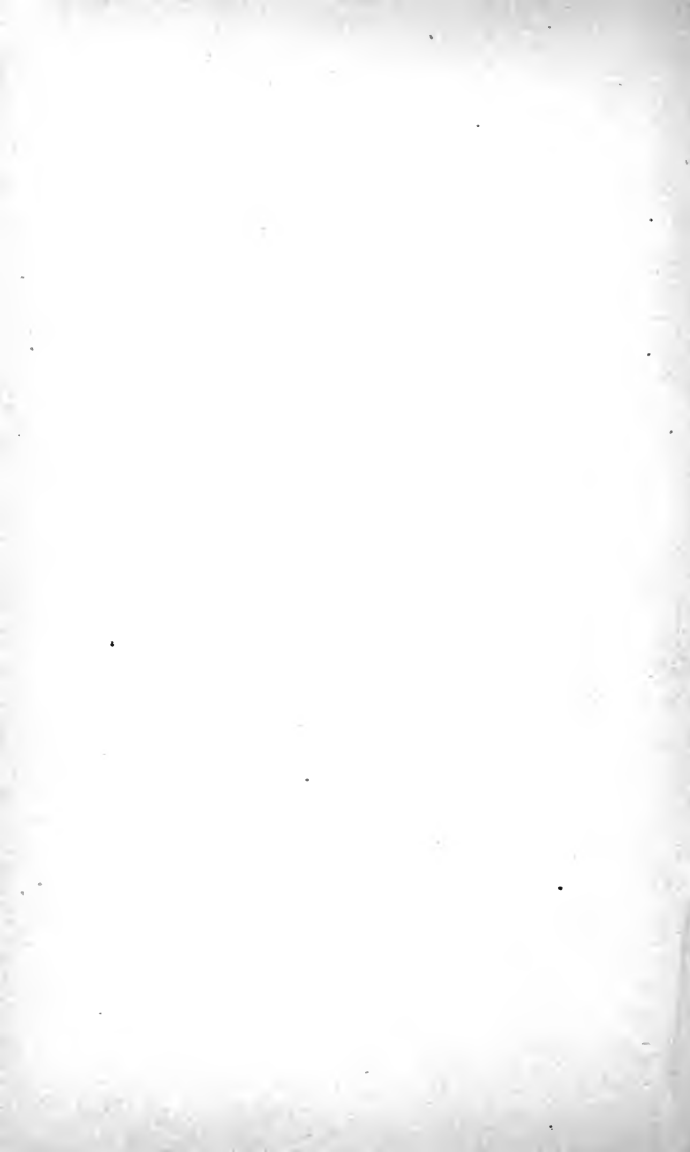


PLATE 13.





Family . . . PHILOPOTAMIDÆ
 Genus . . . *Philopotamus*
 Species . . . *montanus*
 Spurs, 2.4.4.

PLATE XIII

I have placed a figure of *Philopotamus montanus* on Plate XIII, chiefly to show that the TRICHOPTERA are not all studies in sober browns Philopotamus montanus.

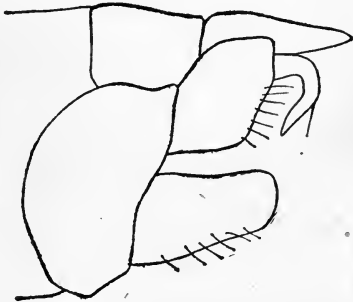


FIG. 36.—Genitalia of *Polycentropus flavomaculatus*, ♂, from the side.

and greys. Some exotic species are beautifully marked, their colouring even embracing crimson.

Philopotamus montanus will no doubt remain unknown to the chalk-stream fisher, but it is to be found by the Dove in Derbyshire, in Devonshire, on many of the Welsh rivers and streams, and I have taken it on the Highland river, the Tummel.

Family . . . PHILOPOTAMIDÆ
 Genus . . . *Chimarrha*
 Species . . . *marginata*
 Spurs, 1.4.4.

PLATE XIII

Chimarrha
marginata.

Chimarrha marginata is a pretty little sedge, with a colouring of dark brown and bright yellow. It is plentiful on the Test, particularly so where the stream runs at a fast pace over mossy boulders. So brightly coloured is this insect that it might well be mistaken for a moth (a caddis-fly being usually more subdued in appearance), did not the magnifying glass reveal the presence of hairs on the wings in lieu of the scales of a lepidopteron.

Family . . . RHYACOPHILIDÆ
 Genus . . . *Rhyacophila*
 Species . . . *dorsalis*
 Spurs, 3.4.4.

PLATE XIII

Rhyacophila
dorsalis.

Rhyacophila dorsalis is one of the commonest of the British caddis-flies, being found on almost every river from April right through spring, summer, and autumn. Occasionally males are found with green bodies, but this seems to be a mere "sport." It is noteworthy that the larvæ of the *Rhyacophilidæ* make themselves

cocoons when pupating, and the cocoon of *dorsalis* is shown on Plate XIII. The larva, until about to pupate, does not make a fixed case, but has a home close at hand, to which it may

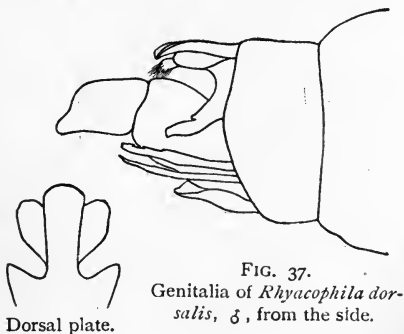


FIG. 37.
Genitalia of *Rhyacophila dorsalis*, ♂, from the side.

retreat in time of need. The genitalia of the male appear in Fig. 37, and I have removed one of the long side pieces in order to show the arrangement of the interior parts.

- Family . . RHYACOPHILIDÆ
 Genus . . *Agapetus*
 Species . . *fuscipes*
 Spurs, 2.4.4.

Agapetus fuscipes is a small dark brown sedge, which on some rivers occurs in great quantities. On the Lambourne and the Dever caddis cases of the pupæ, formed of little clumps of stones attached to larger stones or to pieces of wood, almost completely cover parts of the river bed. The male has a horny plate-like

Agapetus fuscipes.

spur projecting from the sixth ventral segment. The genitalia are shown in Fig. 38.

Another species belonging to this genus is

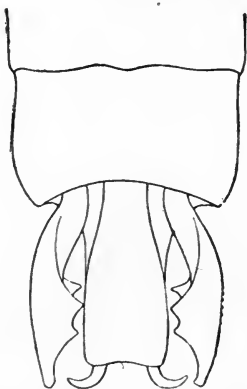


FIG. 38.—Genitalia of *Agapetus fuscipes*, ♂, from above.

Agapetus comatus,

which is present in great numbers on the Test throughout the season.

Family . . . RHYACOPHILIDÆ

Genus . . . *Glossosoma*

Species . . . *vernale*

Spurs, 2.4.4.

Glossosoma vernale,

Glossosoma vernale occurs plentifully on the Dove, and may be recognised by a peculiarity in the wings of the male. At the base are two semicircular raised processes, termed callosities; these are also present, in the only other British

species, *boltoni*. As in *Agapetus fuscipes*, the male carries a spoon-shaped plate extended



FIG. 39.--Genitalia of *Glossosoma vernale*, ♂, from the side.

from the sixth ventral segment. Fig. 39 shows the outline of the male genitalia.

PART IV

THE PERLIDÆ,¹ &C.

I HAVE now disposed of the two divisions of the insect world with which the trout fisherman is mainly concerned, the EPHEMERIDÆ and the TRICHOPTERA, and there remain a few flies belonging to various groups which must not be omitted from this book. The most important are the PERLIDÆ or stone-flies. With the exception of a few of the smaller species, they are not abundant on chalk-streams, but are plentiful on rivers of other type. PERLIDÆ, as a general rule, require a cold temperature, and are more plentiful in the highlands than in low-lying plains. Suffice it to state that on our chalk-streams the only species occurring in any quantities are *Leuctra geniculata*, *Leuctra klapáleki*, *Chloroperla grammatica*, *Nemoura inconspicua*, and *Perlodes microcephala*, of which the first two pass under the name of the willow fly; the third, the yellow sally; and the last, the stone-fly. I have taken stray specimens of *Nemoura variegata*, which frequents lakes and still or sluggish ditches; but it is

¹ Modern writers are inclined to remove the PERLIDÆ from the NEUROPTERA and classify them as a distinct order, the PLECOPTERA.

PLATE 14.

STONE FLIES

Perla maxima, larva
The creeper

Perlodes microcephala
(male)

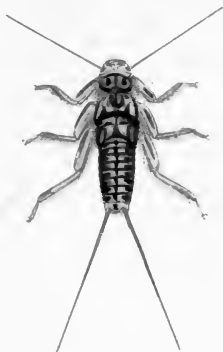
Perlodes microcephala
(female)

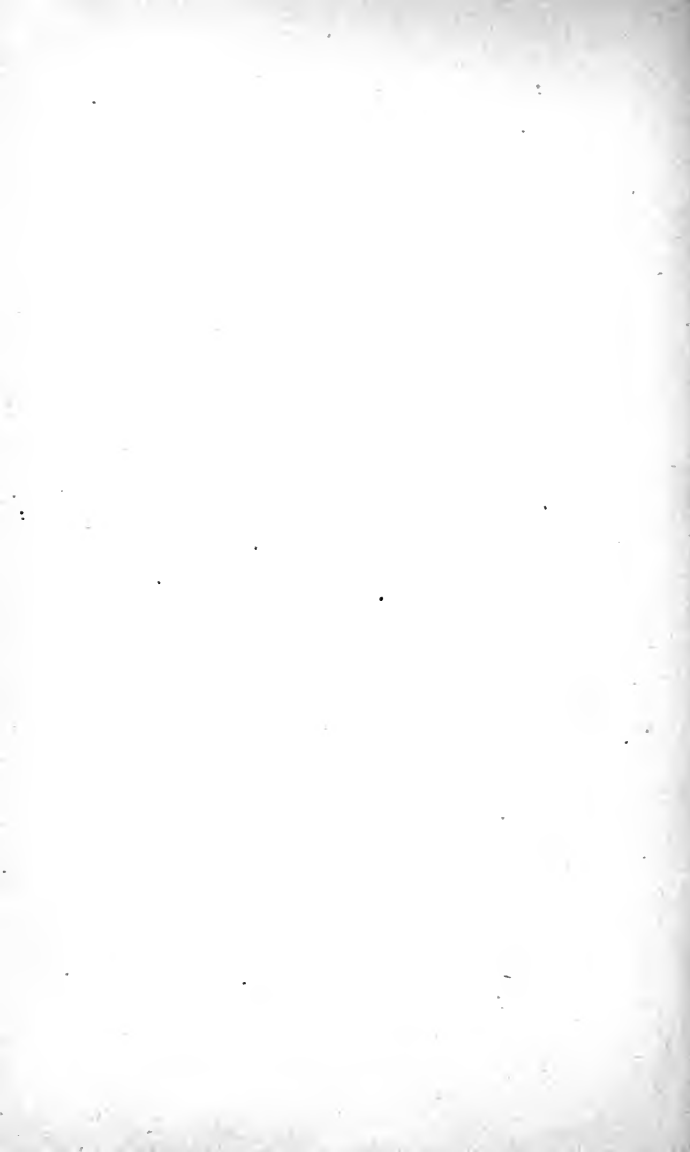
1871

PLATE 14

PLATE 14

PLATE 14.





quite the exception to meet with other species than the five first named on chalk-streams.

A vast Order upon which the dry-fly fisherman occasionally draws is the DIPTERA—two-winged flies, bred both on land and in water; a small Family, the SIALIDÆ, furnishes the alder (*Sialis lutaria*), which has become a much-respected trout-fly—partly from its presence in immense numbers on the bank, giving rise to the impression that as many must be present on the water; and partly from the resemblance that the artificial fly bears to many types of TRICHOPTERA or caddis-flies, when fished dry, or to shrimps, minnows, and other aquatic forms of life when wet.

*Sialis
lutaria,
the alder.*

Family . . . PERLIDÆ
Genus . . . *Perlodes* (*Dictyopteryx*)
Species . . . *microcephala*

PLATE XIV

The only large stone-fly at all abundant on our chalk-streams is *Perlodes microcephala*. I have found it in plenty along the banks of the Kennet, hiding during the daytime under the loose bark of trees and in chinks and crannies of fencing bordering the river.

*PERLODES
micro-
cephala.*

It is rather smaller than the large stone-fly (*Perla maxima* and *P. cephalotes*) of north-country streams, and may be distinguished further by the arrangement of the markings of the head and thorax. The male has short rudi-

mentary wings, and is incapable of flight. The only other *Perlodes* found in this country is *recta*, which is very similar in general appearance, but smaller, and with a somewhat differently shaped head, besides being marked differently on the head and thorax.

PERLODES
recta.

Family . . . PERLIDÆ
Genus . . . *Perla*
Species . . . *maxima*

PLATE XIV

The nymphs or larvæ of *Perla maxima* (the stone-fly of the North) with those of *P. cephalotes*, a closely allied species, share the fisherman's name, "creeper," and are fished

Perla
maxima,
the stone-
fly.

The creeper.

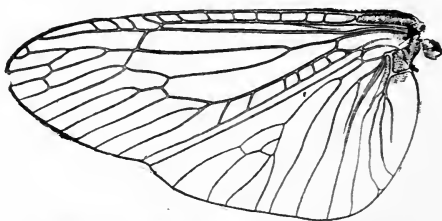


FIG. 40.—*Perla maxima*, ♀, hind wing.

with deadly effect on north-country streams at suitable times of the year.

The two species are very much alike, both in size and in colour. Mr. Morton has pointed out that the female insects may be separated by the examination of the posterior wings, where

PLATE 15.

STONE FLIES

Chloroperla grammatica
(female)
The yellow sally

Tæniopteryx nebulosa
(female)
The February red

Leuctra geniculata
The willow fly

Female

Nemoura meyeri
The early brown

Male

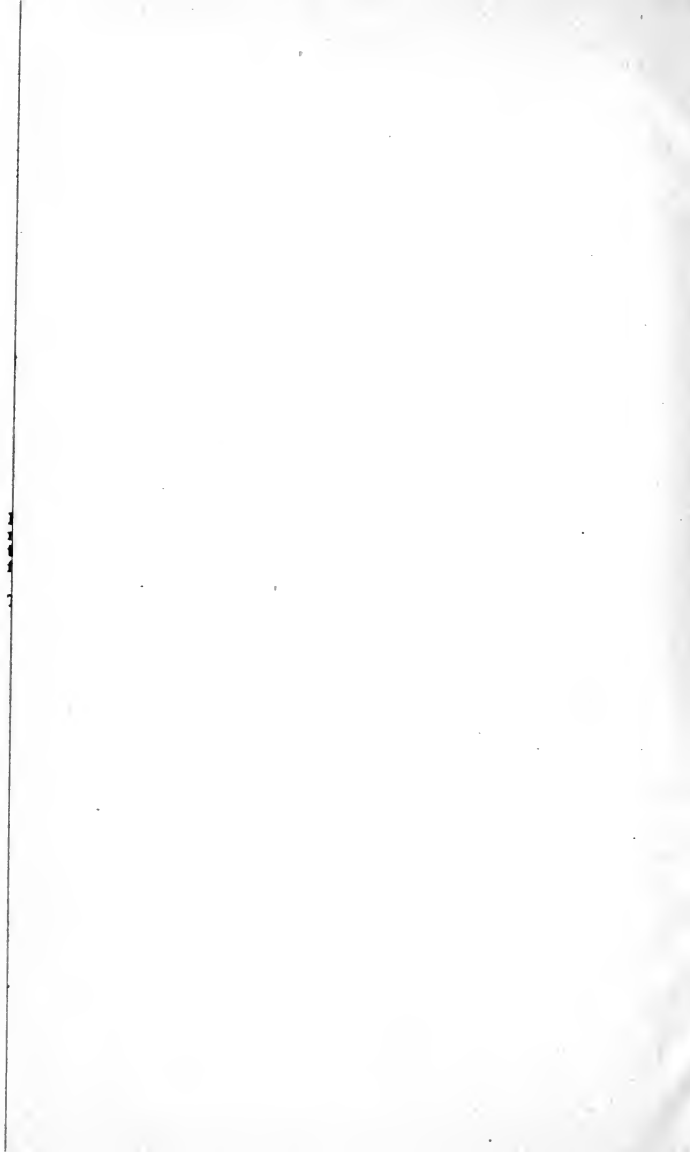
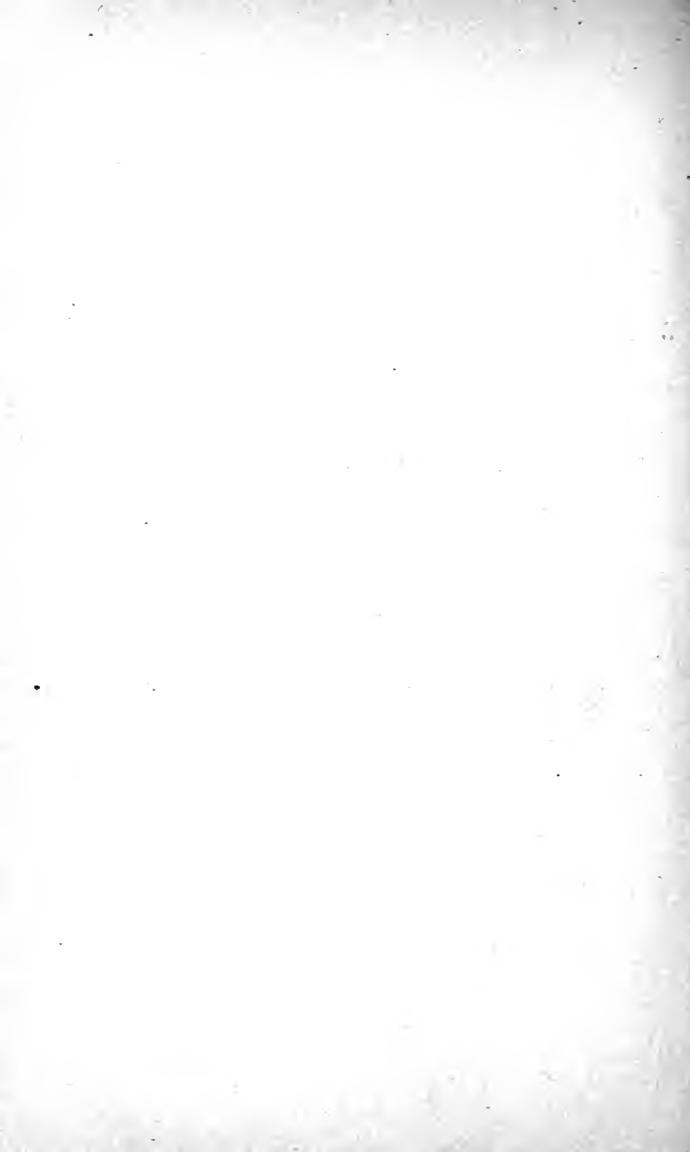


PLATE 15.





a small nervure, absent in *maxima*, is usually to be found in *cephalotes*. It must be noted, however, that neuration is very variable in all the PERLIDÆ, and that this is not a ^{Perla} _{cephalotes.}

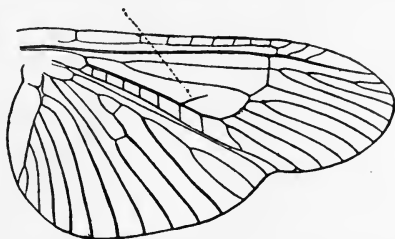


FIG. 41.—*Perla cephalotes*, ♀, hind wing.

constant character. I give drawings of the posterior wings of each species in Figs. 40 and 41 respectively.

The stone-fly is frequently and erroneously termed mayfly in the north.

| | | |
|---------|-----|--------------------|
| Family | . . | PERLIDÆ |
| Genus | . . | <i>Chloroperla</i> |
| Species | . . | <i>grammatica</i> |

PLATE XV

Chloroperla grammatica, the yellow sally, is one of the few PERLIDÆ really abundant on the Test; on other chalk-streams I have found it in far smaller numbers. It may be recognised by its yellowish-green colour, its characteristic PERLIDÆ shape, together with the presence of ^{Chloroperla} _{grammatica,} ^{the yellow} _{sally.}

two setæ or whisks. Mr. Halford states that he has never found it in the autopsies of trout killed by him ; so presumably it is not acceptable to chalk-stream trout. Possibly, however, in other parts of the country, where insect food is less abundant, it may be better appreciated. The fact that a popular name has been bestowed upon it points to anglers having found the imitation of service. The yellow sally is often confused with the yellow may dun, one of the EPHEMERIDÆ, quite different in appearance, except in colour.

Family . . . PERLIDÆ
 Genus . . . *Isopteryx*
 Species . . . *torrentium* and *tripunctata*

Isopteryx
torrentium
 and
Isopteryx
tripunctata.

Two small yellowish stone-flies, having the appearance of diminutive yellow sallies, will be known to most fishermen who frequent rocky trout streams. These are *Isopteryx torrentium* and *Isopteryx tripunctata*. The two species are so nearly alike that it requires a practised eye to tell the difference between them, and for angling purposes, one artificial pattern may well represent them both.

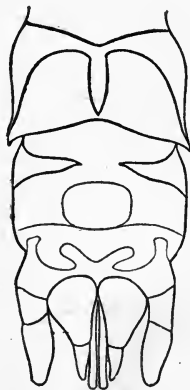
Family . . . PERLIDÆ
 Genus . . . *Leuctra*
 Species . . . *geniculata*

PLATE XV

Leuctra
geniculata,
 willow fly.

Leuctra geniculata, the Hampshire willow fly, is so plentiful on the Test and Itchen in

autumn as to be a positive nuisance to the fisherman. It settles on the face and clothing, dropping from the trees, and eludes removal with great agility. The female deposits the eggs by letting them fall in a mass from some little height above the water. I give a figure of the genitalia of the male insect (Fig. 42). Another species of *Leuctra* is found on the Test at the same time as *geniculata*—*L. klapálecki*. It is smaller and darker than *geniculata*, the true willow fly, and the fish take it equally freely.



Leuctra klapálecki

FIG. 42.—Genitalia of *Leuctra geniculata*, ♂, from above.

I give a drawing of the wings of *L. hippopus*, a species plentiful on the river Dove, in Fig. 43.

| | |
|---------------|----------------|
| Family . . . | PERLIDÆ |
| Genus . . . | <i>Nemoura</i> |
| Species . . . | <i>meyeri</i> |

PLATE XV

I give *Nemoura meyeri* as a type of a whole group of small stone-flies very plentiful on streams other than those arising from the chalk. The genus *Nemoura* has a Greek-cross-like configuration of nervures in the wings, which is shown in the Plate. I have heard *Nemoura meyeri* described as the early brown, but I

Nemoura meyeri.

Early
brown.

fancy it shares this name with several of the smaller stone-flies which appear in spring. As mentioned previously, I have taken *Nemoura*

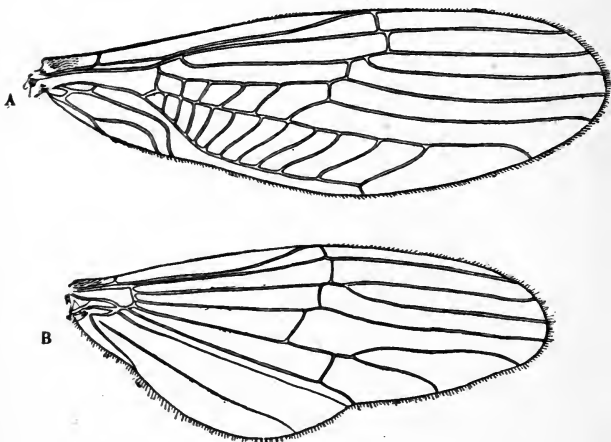


FIG. 43.—Wings of *Leuctra hippopus*, ♂.
a. Anterior wing. b. Posterior wing.

Nemoura
inconspicua
and
Nemoura
variegata.

inconspicua quite plentifully on the Test, and isolated examples of another species, *Nemoura variegata*, on the Lambourne; but these resemble *meyeri* too closely to warrant description here.

Family . . . PERLIDÆ
Genus . . . *Tæniopteryx*
Species . . . *nebulosa*

PLATE XV

Tæniopteryx
nebulosa, febru-
ary red.

The female of *Tæniopteryx nebulosa* is known as the february red, and I reproduce it here

with the ventral side uppermost, in order to show the characteristic deep orange-red colour of the underside of the abdomen. The male is an insignificant little fly, with long sprawling legs and often, but not always, aborted wings. *T. nebulosa* has not yet been reported on chalk-streams. Another species, very plentiful in the north, is *T. risi*. Tæniop-
teryx risi.

| | | |
|---------|-----|-------------------|
| Order | . . | Neuroptera |
| Family | . . | SIALIDÆ |
| Genus | . . | <i>Sialis</i> |
| Species | . . | <i>lutaria</i> |

PLATE XVI

Sialis lutaria is the alder of the fisherman, and occurs in abundance on the banks of almost every trout-stream in this country. Its value to the fisherman is probably due to the resemblance shown by his artificial pattern to the welshman's button or other caddis-flies, for the alder itself is rarely found in the water, as it deposits its eggs on the sedge, and the mature fly emerges through the turf. Sialis lutaria,
the alder.

A second species, *Sialis fuliginosa*, occurs in this country, differing from *S. lutaria* in its darker colour (nearly black), and in the position of a small nervure in the anterior wings. I have taken this species on the banks of the Tummel. Sialis
fuliginosa.

| | | |
|---------|-----|-------------------|
| Order | . . | Diptera |
| Family | . . | CHIRONOMIDÆ |
| Genus | . . | <i>Chironomus</i> |
| Species | . . | <i>tentans</i> |

PLATE XVI

*Chironomus
tentans.*

Chironomus tentans has been brought prominently before the angling fraternity by Mr. Hugh T. Sheringham. He has stated that it occurs in enormous quantities on Blagdon reservoir, and that quite big fish will feed upon it. *Tentans* has also been sent to me from Lough Arrow, and I believe it occurs on a good many lakes and reservoirs. At Mr. Sheringham's request I prepared an article on this fly, which was published in the "Field" of 10. 9. 11, and at the same time I gave the dressing for an artificial pattern, which I believe has been quite successfully used on Blagdon waters. *C. tentans* appears in all the warmer months, generally after sunset.

*Chironomus
viridis.*

Chironomus viridis, which also occurs at Blagdon, is a somewhat smaller fly with an emerald-green body. It appears in even greater numbers than *tentans*, and at times is so plentiful that the swarms of insects have the appearance of a heavy mist over the neighbouring fields, but it does not seem to be so regular or frequent at Blagdon as the other species. It has been seen plentifully in September. *Viridis*, when it does appear, is much appreciated by the trout, as is evidenced by the large numbers of the winged

PLATE 16.

VARIOUS FLIES

Sialis lutaria
The alder

Male

Female

Chironomus tentans

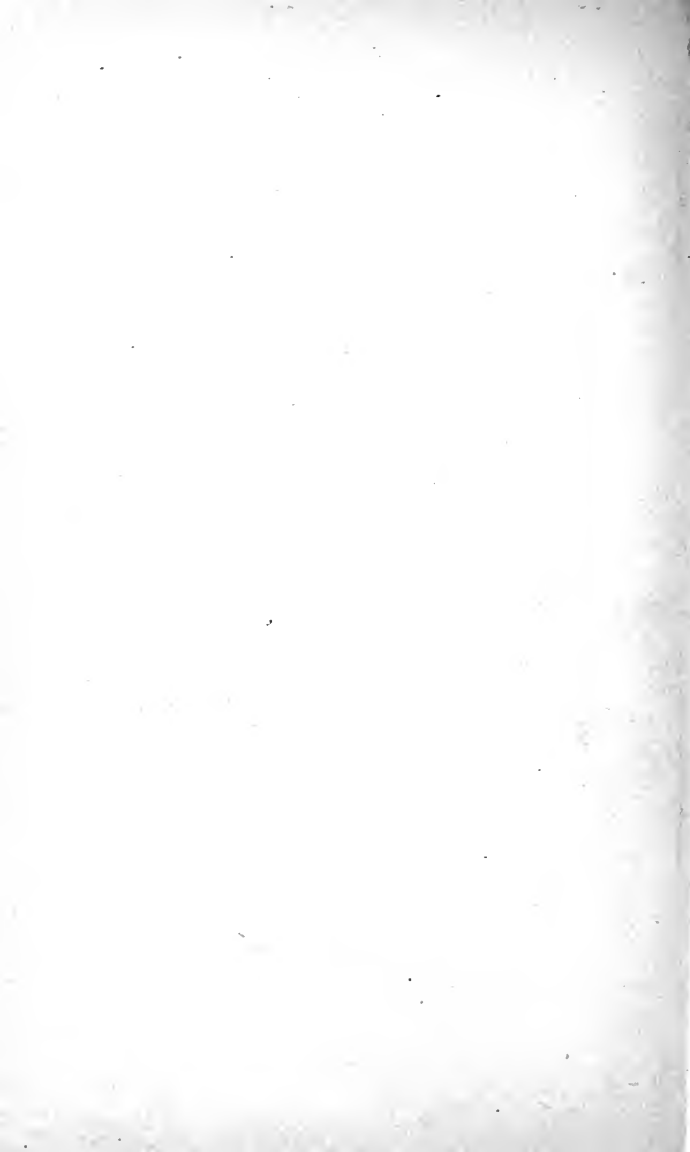
Myrmica rubra
The brown ant

Anisomera burmeisteri
The gravel bed



PLATE 16





fly as well as of the pupæ found in autopsies when the fly is "on."

| | | |
|---------|-----|--------------------|
| Order | . . | Diptera |
| Family | . . | LIMNOBIDÆ |
| Genus | . . | <i>Anisomera</i> |
| Species | . . | <i>burmeisteri</i> |

PLATE XVI

It is with some hesitation that I have included an account of the gravel bed amongst these brief notes on the trout fisherman's flies. Personally I have never met with it alive, and know nothing about its habits from my own observation. I am told that it is to be found in great numbers at certain times and in certain seasons on the dry gravel banks that form in the bed of rivers which it frequents, and that the trout will feed upon it greedily. Just as this work was nearing completion, two correspondents sent me the insect they knew as the gravel bed, and these specimens were similar to a fly sent me some years ago by a third correspondent under the same popular name.

The
gravel bed,
Anisomera
burmeisteri.

The independent testimony of my three friends seemed a sufficiently safe indication that I had the real gravel bed before me. I therefore sent specimens to Mr. E. E. Austen of the Natural History Museum, one of the leading authorities on the Diptera, and he, with his usual kindness, gave the matter his per-

sonal attention, and informed me of the scientific name given above.

Other dipterous flies, to which anglers have ascribed popular names, may be mentioned—
 Black gnat. the black gnat, the hawthorn fly, and the oak fly or down-looker. The black gnat, as its name implies, is a small dark fly, differing in no very marked respect from many others taken by fish when smutting. Its scientific name is *Bibio johannis*.

Hawthorn fly.
 Oak fly. Closely related to it, but much larger, is the hawthorn fly (*B. marci*). The oak fly is usually to be found on the trunks of trees, standing head downwards—the characteristic attitude that gives it the second popular name. Its scientific name is *Leptis scolopacea*. Why these last two flies have been adopted by anglers as “trout flies” has always been rather a puzzle to me, as both kinds are far more plentiful on land than on water; but no doubt at times they get blown on to the stream, and are welcomed by the trout as an inviting if unexpected addition to the larder.

The names are enrolled amongst the patterns popular in the early days of fly nomenclature; and in Devonshire the hawthorn has a short season of its own amongst fly-fishers, about the time when the May blooms.

| | | |
|---------|-----|--|
| Order | . . | Hymenoptera |
| Family | . . | MYRMICIDÆ |
| Genus | . . | <i>Myrmica</i> |
| Species | . . | <i>rubra</i> , Linn. (<i>lævinodis</i> , Nyl.) |

PLATE XVI

The brown ant needs no description supplemental to the figure given. It is an uncertain fly for the fisherman, but when it does appear on the water its numbers are usually sufficient to cause a veritable orgie amongst the trout. In the Hebrides, sea-trout have been found to take it freely when it has been blown on to the water. *M. lævinodis* is one of six races of *M. rubra*, the only European species native in our country. Most of the races are common, especially one named *scalerinodis*, Nylander, according to the late Mr. Edward Saunders.

Brown ant

PART V

LISTS OF DESCRIBED BRITISH EPHEMERIDÆ, TRICHOPTERA, AND PERLIDÆ

THE lists, as the title indicates, contain all the known species of British EPHEMERIDÆ, TRICHOPTERA, and PERLIDÆ. Roman figures opposite individual species indicate the months during which they occur on the Hampshire Test and the Derbyshire Dove. I have selected these rivers as being typical of two distinct classes of streams on which dry-fly fishing is practised. It should be noted, however, that I am only dealing with flies that have actually passed through my hands; and the absence of any record of a particular species must be understood to indicate merely that this fly has not been captured and sent to me for identification from either of the rivers here dealt with. The majority of species recorded from the Dove were sent by Mr. John Henderson, and his son, Mr. Jack Henderson, of Clifton, Ashbourne. With the single exception of *Ephemera vulgata*, which has been recorded by Mr. Eaton, all the flies indicated as occurring

on the Test have been observed by myself. Three columns have been left blank in case fishermen should care to make a record of the flies appearing on their own trout waters or other fisheries in which they may be interested, and at the end of the book a few blank pages and plates have been inserted for readers' own notes and sketches.

| | R. TEST. | R. DOVE. |
|-------------------------|----------------|------------------|
| EPHEMERIDÆ | | |
| EPHEMERA, Linn. | | |
| 1. vulgata, Linn. | v. VI. | |
| 2. danica, Müll. | v. VI. | v. VI. |
| 3. lineata, Eaton. | | |
| POTAMANTHUS, Pict. | | |
| 4. luteus, Linn. | | |
| LEPTOPHLEBIA, Westw. | | |
| 5. marginata, Linn. | IV. | |
| 5. submarginata, Steph. | v. VI. VII. | v. VI. VII. |
| <i>Brown</i> | VIII. | VIII. |
| 7. cincta, Retz | | |
| 8. vespertina, Eaton. | v. VII. VIII. | |
| <i>Claret Dun</i> | IX. | |
| HABROPHLEBIA, Eaton. | | |
| 9. fusca, Curt. | | |
| EPHEMERELLA, Walsh. | | |
| 10. ignita, Poda. | VI. VII. VIII. | IV. V. VI. VII. |
| <i>Olive</i> | IX. X. | VIII. IX. X. XI. |
| 11. notata, Eaton | | |

CÆNIS, Steph.

- 12. dimidiata, Steph.
- 13. rivulorum, Eaton.
- 14. halterata, Fab.
- 15. harrisella, Curt.

VII.

BAËTIS, Leach.

- 16. binoculatus, Linn. { *Pale Watery Duns*¹
- 17. scambus, Eaton. {
- 18. vernus, Curt. {
- 19. rhodani, Pict. { *Olive Duns*
- 20. atrebatinus, Eaton. {
- 21. tenax, Eaton. {
- 22. buceratus, Eaton. { *Iron-blue Duns*
- 23. pumilus, Burm. } {
- 24. niger, Linn. } {

v. VI. VII.
VIII. IX. X.

VIII. IX. X. XI.

Every month

IV. V. VI. VII.
VIII. IX. X.

IV. V. VI. VII.
VIII. IX. X.

CENTROPTILUM, Eaton.

- 25. luteolum, Müll. { *Pale Watery Duns*¹
- 26. pennulatum, Eaton. {

v. VI. VII.
VIII. IX. X.

VIII. IX. X.
XI.

CLOËON, Leach.

- 27. dipterum, Linn.
- 28. simile, Eaton.
- 29. rufulum, Müll.

V.

¹ Records in my possession class the pale, small species of both *Baëtis* and *Centroptilum* as pale watery duns, without distinction of genus or species, and also species of *Baëtis*, 18-22, as olive duns indiscriminately.

| | R. TEST. | R. DOVE. |
|--|-----------------------|--------------|
| AMELETUS, Eaton. 30. inopinatus, Eaton. | | |
| SIPHLURUS, Eaton. 31. armatus, Eaton. 32. lacustris, Eaton. | | |
| RHITHROGENA, Eaton. 33. semicolorata, Curt. <i>Yellow Upright</i> | | IV. |
| HEPTAGENIA, Walsh. 34. sulphurea, Müll. <i>Yellow May Dun or Yellow Hawk</i> . . . 35. flavipennis, Dufour. | VI. VII. VIII. IX. | V. |
| ECDYURUS, Eaton. 36. venosus, Fab. <i>March Brown</i> 37. insignis, Eaton. 38. volitans, Eaton. 39. lateralis, Curt. | | IV. V. VIII. |

TRICHOPTERA

INÆQUIPALPIA

Family **PHRYGANEIDÆ**

NEURONIA, Leach.

1. ruficus, Scop.
2. clathrata, Kol.

PHRYGANEA, Linn.

- | | |
|------------------------------|------------------------------------|
| 3. grandis, Linn. | } <i>Large Red</i> <i>Sedge</i> |
| 4. striata, Linn. | |
| 5. obsoleta (Hagen), McLach. | |
| 6. varia, Fab. | |
| 7. minor, Curt. | |

v. VI. VII.
v. VI.

AGRYPNIA, Curt.

8. picta, Kol.
9. pagetana, Curt.

Family **LIMNOPHILIDÆ**

COLPOTAULIUS, Kol.

10. incisus, Curt.

VI. VII.

| | R. TEST. | R. DOVE. |
|--|--------------------|----------|
| GRAMMOTAULIUS, Kol. | | |
| 11. nitidus, Müll. | | |
| 12. atomarius, Fab. | | |
| GLYPHOTÆLIUS, Steph. | | |
| 13. pellucidus, Retz. | IX. | |
| LIMNOPHILUS, Leach. | | |
| 14. rhombicus, Linn. | VI. VII. VIII. IX. | |
| 15. borealis, Zett. | | |
| 16. <i>pavidus</i> (Hagen), McLach. | | |
| 17. subcentralis, Brauer. | | |
| 18. flavicornis, Fab. | VIII. IX. X. | |
| 19. decipiens, Kol. | VIII. IX. X. | |
| 20. marmoratus, Curt. | | |
| 21. stigma, Curt. | | |
| 22. xanthodes, McLach. | | |
| 23. <i>borealis</i> , Kol. nec Zett. | | |
| 24. lunatus, Curt. <i>Cinnamon</i> | VI. VII. VIII. | |
| 25. <i>Sedge</i> | IX. X. | |
| 26. elegans, Curt. | | |
| 27. politus, McLach. | | |
| 28. fuscinervis, Zett. | | |
| 29. ignavus (Hagen), McLach. | IX. | |
| 30. nigriceps, Zett. | | |
| 31. <i>striola</i> , Kol. | | |
| 32. centralis, Curt. | | |

29. vittatus, Fab.
 30. affinis, Curt.
 31. auricula, Curt. IX.
 32. griseus, Linn.
 33. bipunctatus, Curt.
 34. extricatus, McLach. VI.
 35. hirsutus, Pict. VI.
 36. luridus, Curt.
 37. sparsus, Curt. V. VI.
 38. fuscicornis, Ramb. VI.
fumigatus, Germ. (?)

ANABOLIA, Steph.

39. nervosa (Leach), Curt. VIII. IX. X.

IX. X.

PHACOPTERYX, Kol.

40. brevipennis, Curt.

ASYNARCHUS, McLach.

41. coenosus, Curt.

STENOPHYLAX, Kol.

42. alpestris, Kol.
 43. dubius, Steph.
 44. infumatus, McLach.
 45. rotundipennis, Brauer.

| | | | |
|--|--|------|------------|
| 46. stellatus, Curt. | | | R. DOVE. |
| 47. latipennis, Curt. | | | v. IX. |
| <i>radiatus</i> , Ramb. | | | v. |
| 48. vibex, Curt. | | | |
| 49. permistus, McLach. | | IX. | |
| <i>concentricus</i> , McLach., nec Zett. | | | |
| <i>hieroglyphicus</i> , Steph. | | | |
| MESOPHYLAX, McLach. | | | |
| 50. aspersus, Ramb. | | | |
| 51. impunctatus, McLach. | | | |
| <i>zealandicus</i> , McLach., var. | | | |
| MICROPTERNA, Stein. | | | |
| 52. sequax, McLach. | | | |
| <i>striata</i> , Pict. nec Linn. | | | |
| 53. lateralis, Steph. | | VII. | |
| HALESUS, Steph. | | | |
| 54. radiatus, Curt. | | | IX. X. |
| 55. digitatus, Schr. | | | IX. X. |
| <i>hieroglyphicus</i> , Curt. | | | |
| 56. auricollis, Pict. | | | IX. X. XI. |
| 57. guttatipennis, McLach. | | | X. XI. |

| | | | | |
|---|---|---|-----------------------|--------|
| DRUSUS, Steph. | | | | |
| 58. annulatus, Steph. | • | • | VI. VII. VIII. IX. | |
| ECCLISOPTERYX, Kol. | | | | V. |
| 59. guttulata, Pict. | • | • | | |
| CHÆTOPTERYX, Steph. | | | | X. XI. |
| 60. villosa, Fab. <i>tuberculosa</i> , Pict. | • | • | IX. X. XI. | |
| ENOICYLA, Ramb. | | | | |
| 61. pusilla, Burm. | | | | |
| APATANIA, Kol. | | | | |
| 62. wallengreni, McLach. <i>vestita</i> , Kol. | | | | |
| 63. muliebris, McLach. | | | | |
| 64. fimbriata, Pict. | | | | |

| | R. TEST. | R. DOVE. |
|---|---------------------------------|-----------------------------|
| <p>Family SERICOSTOMATIDÆ Sub-family Sericostomatinae SERICOSTOMA, Latr.</p> | | |
| <p>65. personatum, Spence. <i>The Welshman's Button</i> . . . <i>spencii</i>, Kirby. <i>muliguttatum</i>, Pict., var. <i>analis</i>, Steph., var.</p> | <p>v. VI. VII. VI.</p> | <p>VI.</p> |
| <p>NOTIDOBIA, Steph.</p> | | |
| <p>66. ciliaris, Linn.</p> | <p>V.</p> | |
| <p>Sub-family Goërinæ GOËRA, Leach.</p> | | |
| <p>67. pilosa, Fab. <i>flavipes</i>, Curt.</p> | <p>VI. VII. VIII.</p> | |
| <p>SILo, Curt.</p> | | |
| <p>68. pallipes, Fab. 69. nigricornis, Pict. <i>fumipennis</i>, McLach.</p> | <p>{ V. VI. VII. VIII.</p> | <p>VIII. IX. VIII.</p> |

Sub-family **Brachycentrinæ**

BRACHYCENTRUS, Curt.

70. subnubilus, Curt. *The Gran-nom.*

IV.

Sub-family **Lepidostomatinae**

CRUNGEA, McLach.

71. irrorata, Curt.

LASIOCEPHALA, Costa.

72. basalis, Kol.

IX.

IX

LEPIDOSTOMA, Ramb.

Mormonia, Curt.

73. hirtum, Fab.

VII. VIII. IX. VII. VIII. IX.

ÆQUIPALPIA

Family **ODONTOCERIDÆ**

ODONTOCERUM, Leach.

74. albicorne, Scop. *Grey Sedge.*

{ VI. VII. VIII. IX. }
v.

Family **LEPTOCERIDÆ**

Sub-family **Leptocerinæ**

LEPTOCERUS, Leach.

| | | | |
|--|----|----------------|----------------|
| 75. <i>nigronervosus</i> , Retz. | v. | | |
| 76. <i>fulvus</i> , Ramb. | | | |
| 77. <i>grossus</i> , Steph. | | | |
| 77. <i>senilis</i> , Burm. | | | |
| 77. <i>fulvus</i> , McLach. | | | |
| 78. <i>alboguttatus</i> , Hagen. | | | |
| 78. <i>bimaculatus</i> , Steph. | | | |
| 79. <i>annulicornis</i> , Steph. | | | |
| 80. <i>aterimus</i> , Steph. <i>Black Silver-horns</i> | | VI. VII. | VII. VIII. IX. |
| 81. <i>cinereus</i> , Curt. <i>Brown Silver-horns</i> | | { v. VI. VII. | } VII. |
| 82. <i>albifrons</i> , Linn. <i>Brown Silver-horns</i> | | { VIII. IX. | } IX. |
| 83. <i>commutatus</i> (Rostock), McLach. | | VII. VIII. IX. | IX. |
| 84. <i>bilineatus</i> , Linn. | | | |
| 84. <i>bifasciatus</i> , Oliv. | | | |
| 85. <i>dissimilis</i> , Steph. | | | |

| | | | | |
|---|-----------------------------|--|------------------|------------|
| MYSTACIDES, Latr. | | | | |
| 86. nigra, Linn. | } <i>Black Silver-horns</i> | | V. VI. VII. | |
| 87. azurea, Linn. | | | { V. VI. VII. | |
| 88. longicornis, Linn. <i>Grouse Wing quadrifasciata</i> , Fab. | | | { VIII. IX. VII. | VII. VIII. |
| TRIENODES, McLach. | | | | |
| 89. conspersa, Ramb. | | | VII. VIII. IX. | VII. |
| 90. reuteri, McLach. | | | | |
| 91. bicolor, Curt. | | | | |
| EROTESIS, McLach. | | | | |
| 92. baltica, McLach. | | | VII. | |
| ADICELLA, McLach. | | | | |
| 93. flicornis, Pict. | | | | |
| 94. reducta, McLach. | | | VII. | |
| ŒCETIS, McLach. | | | | |
| 95. ochracea, Curt. | | | | |
| 96. furva, Ramb. | | | | |
| 97. lacustris, Pict. | | | | |
| 98. notata, Ramb. | | | | |
| 99. testacea, Curt. | | | | VII. |

| | R. TEST. | R. DOVE. |
|---|-----------------------|----------|
| SETODES, Ramb. 100. tinceiformis, Curt. 101. interrupta, Fab. 102. argentipunctella, McLach. 103. punctata, Fab. | | |
| Family MOLANNIDÆ Sub-family Molanninæ MOLANNA, Curt. 104. angustata, Curt. . . . 105. palpata, McLach. | VI. VII. | |
| Sub-family Beræinæ BERÆA, Steph. 106. pulkata, Curt. . . . 107. maurus, Curt. . . . 108. articularis, Pict. | VI. VII. VIII. VI. | |
| BERÆODES, Eaton. 109. minuta, Linn. | v. | |

Family **HYDROPSYCHIDÆ**

Sub-family **Hydropsychinæ**

HYDROPSYCHE, Pict.

- | | |
|-----------------------------------|----------------|
| 110. pellucidula, Curt. | V. VI. |
| 111. fulvipes, Curt. | |
| 112. instabilis, Curt. | VII. VIII. IX. |
| 113. angustipennis, Curt. | VIII. |
| 114. ornatula, McLach. | |
| 115. guttata, Pict. | IV. V. VI. |
| <i>contubernalis</i> , McLach. | |
| 116. exocellata, Dufour. | |
| <i>ophthalmica</i> , Ramb. | |
| 117. lepida, Pict. | VII. VIII. |
| <i>ventralis</i> , Curt. | |

DIPLECTRONA, Westw.

118. felix, McLach.
 flavomaculata, Steph.

Family **POLYCENTROPIDÆ**

Sub-family **Polycentropinæ**

NEURECLIPSIS, McLach.

119. bimaculata, Linn.

| | R. TEST. | R. DOVE. |
|------------------------------------|----------------|----------------|
| PLECTROCNEMIA, Steph. | | |
| 120. conspersa, Curt. | VII. VIII. IX. | |
| 121. geniculata, McLach. | | |
| 122. brevis, McLach. | | |
| POLYCENTROPUS, Curt. | | |
| 123. flavomaculatus, Pict. | { V. VI. VII. | VII. VIII. IX. |
| 124. multiguttatus, Curt. | { VIII. IX. | X. |
| 125. kingi, McLach. | IX. | |
| Holocentropus, McLach. | | |
| 126. dubius, Ramb. | | |
| <i>parfitti</i> , McLach. | | |
| 127. stagnalis, Albarda. | | |
| 128. picicornis, Steph. | | |
| CYRNUM, Steph. | | |
| 129. trimaculatus, Curt. | | IX. |
| 130. flavidus, McLach. | | |

Sub-family **Ecnominæ**

ECNOMUS, McLach.

131. *tenellus*, Ramb.

Family **PSYCHOMYIDÆ**

TINODES, Leach.

132. *wæneri*, Linn.

lurida, Curt.

133. *aureola*, Zett.

pusilla, Curt.

134. *assimilis*, McLach.

135. *maculicornis*, Pict.

136. *unicolor*, Pict.

137. *dives*, Pict.

schmidtii, Kol.

LYPE, McLach.

138. *phæopa*, Steph.

139. *reducta*, Hagen

140. *fragilis*, Pict.

PSYCHOMYIA, Latr.

141. *pusilla*, Fab.

gracilipes, Curt.

VIII.

VIII.

VIII.

VIII.

VIII.

VII.

VI. VII. IX.

VIII. IX.

| | R. TEST. | R. DOVE. |
|--|---|---|
| <p>Family PHILOPOTAMIDÆ</p> <p>PHILOPOTAMUS, Leach.</p> <p>142. <i>montanus</i>, Don.</p> <p> <i>scopulorum</i>, Steph.</p> <p> <i>scoticus</i>, McLach., var.</p> <p> <i>chrysopterus</i>, Morton, var.</p> <p> <i>insularis</i>, McLach., var.</p> <p> <i>cesareus</i>, McLach, var.</p> | | VI. |
| <p>WORMALDIA, McLach.</p> <p>143. <i>occipitalis</i>, Pict.</p> <p>144. <i>mediana</i>, McLach.</p> <p>145. <i>subnigra</i>, McLach.</p> | VII. | |
| <p>CHIMARRHA, Leach.</p> <p>146. <i>marginata</i>, Linn.</p> | VII. VIII. | |
| <p>Family RHYACOPHILIDÆ</p> <p>Sub-family Rhyacophilinæ</p> <p>RHYACOPHILA, Pict.</p> <p>147. <i>dorsalis</i>, Curt.</p> <p>148. <i>septentrionis</i>, McLach.</p> <p>149. <i>obliterata</i>, McLach.</p> <p>150. <i>munda</i>, McLach</p> | <p>{</p> <p>IV. V. VI. VII.</p> <p>VIII. IX. X. XI.</p> | <p>IV. V. VI. VII.</p> <p>VIII. IX. X. XI.</p> <p>IX.</p> |

Sub-family **Glossosomatinae**

GLOSSOSOMA, Curt.

151. *boltoni*, Curt.
 152. *vernale*, Fict.
fimbriatum, Steph.

III. IX. X.

AGAPETUS, Curt.

153. *fuscipes*, Curt.
 154. *comatus*, Fict.
 155. *delicatulus*, McLach.

{
 V. VI. VII.
 VIII. IX. X.
 V. VIII. IX. X.

IV. IX.

IX.

IX.

Family **HYDROPTILIDÆ**

GRAYLEA, Curt.

156. *multipunctata*, Curt.
 157. *pallidula*, McLach.

ALLOTRICHA, McLach.

158. *pallicornis*, Eaton.

VI.

HYDROPTILA, Dalm.

Phrixocoma, Eaton.

159. *sparsa*, Curt.

{
 V. VI. VII.
 VIII. IX.

VII.

| | R. TEST. | R. DOVE. |
|-----------------------------|---------------------------|-----------|
| 160. occulta, Eaton | VII. VIII. IX. | VIII. |
| 161. femoralis, Eaton | V. VI. | VIII. |
| 162. maclachlani, Klap. | VII. | |
| 163. pulchricornis, Pict. | { VI. VII. VIII. IX. X. } | VIII. IX. |
| 164. forcipata, Eaton | | |
| 165. tigurina, Ris. | | |
| 166. sylvestris, Morton | V. VI. VII. VIII. IX. | IX. |
| 167. simulans, Mosely | VII. | |
| 168. angulata, Mosely | VIII. IX. | VIII. |
| ITHYTRICHIA, Eaton. | | |
| 169. lamellaris, Eaton | | |
| ORTHOTRICHIA, Eaton. | | |
| 170. angustella, McLach. | | |
| 171. tetensii, Kolbe. | | |
| OXYETHIRA, Eaton. | | |
| 172. costalis, Curt. | VII. | |
| 173. tristella, Klap. | | |
| 174. simplex, Ris. | IV. VI. VIII. | |
| 175. falcata, Morton | VI. VIII. IX. X. | |
| 176. frici, Klap. | | |
| 177. mirabilis, Morton | | |
| 178. sagittifera, Ris. | | |
| 179. distinctella, McLach. | | |

LIST OF BRITISH PERLIDÆ

PERLA, Geof.

1. maxima, Scop. *Stone-fly.*
2. marginata, Fanz. Do.
3. cephalotes, Curt. Do.

PERLODES, Banks

4. microcephala, Pict. *Stone-fly*
5. recta, Kempny.

ISOGENUS, Newm.

6. nubecula, Newm.

CHLOROPERLA, Newm.

7. grammatica, Poda. *Yellow Sally*
8. griseipennis, Pict. Do.

ISOPTERYX, Pict.

9. tripunctata, Scop.
10. torrentium, Pict. . . .

CAPNIA, Pict.

11. nigra, Pict.
12. atra, Morton.

R. TEST.

R. DOVE.

v.

v.

v.

v. VI.

v. VI. VII.

v.

| | R. TEST. | R. DOVE. |
|--|-------------------------------|-----------------|
| TÆNIPTERYX, Pict. | | |
| 13. nebulosa, Linn. <i>February Red</i> | | II. III. |
| 14. putata, Newm. | | |
| 15. risi, Morton. | | |
| NEMOURA, Latr. | | |
| 16. præcox, Morton. | | IV. V. VI. VII. |
| 17. meyeri, Pict. <i>Early Brown</i> | | |
| 18. cinerea, Oliv. <i>Needle Fly.</i> | | |
| 19. standfussi, Ris. | | |
| 20. variegata, Oliv. | | |
| 21. marginata, Pict. | | |
| 22. cambrica, Morton. Do. | | |
| 23. avicularis, Morton. | | |
| 24. dubitans, Morton. | | |
| 25. inconspicua, Pict. | { IV. V. VII. VIII. IX. X. | |
| LEUCTRA, Steph. | | |
| 26. geniculata, Steph. <i>Willow Fly</i> | IX. X. XI. | IX. X. XI. |
| 27. klapáleki, Kempny. Do. | IX. X. XI. | IX. X. XI. |
| 28. albida, Kempny. | | |
| 29. hippopus, Kempny. <i>Needle Fly</i> | | IV. V. VI. VII. |
| 30. inermis, Kempny. Do. | | |
| 31. nigra, Klap. | | |

INDEX

ABDOMEN of insects, 10

- Adicella*, 20, 95
 — *filicornis*, 95
 — *reducta*, 95
Æquipalpia, 16, 93
Agapetus, 20, 101
 — *comatus*, 68, 101
 — *delicatulus*, 101
 — *fuscipes*, 67-8, 101
Agraylea, 20, 101
 — *multipunctata*, 101
 — *pallidula*, 101
Agrypnia, 20-87
 — *pagetana*, 87
 — *picta*, 87
 Alder, 71, 77
Allotrichia, 20, 101
 — *pallicornis*, 101
Ameletus, 14, 86
 — *inopinatus*, 86
Anabolia, 20, 89
 — *nervosa*, 45, 89
Anisocentropus, 16
Anisomera burmeisteri, 79
 Ant, brown, 81
 Antennæ, 8
Apatania, 20, 91
 — *fimbriata*, 91
 — *muliebris*, 91
 — *wallengreni*, 91
Asynarchus, 20, 89
 — *cænosus*, 89
 Autumn dun, 36-7
Baëtis, 14, 85
 — *atrebatinus*, 28, 85
 — *binoculatus*, 30-1, 85
 — *bucératus*, 28, 85
 — *niger*, 32-3, 85
 — *pumilus*, 32-3, 85
 — *rhodani*, 28, 85
 — *scambus*, 30-1, 85
 — *tenax*, 28, 85
 — *vernus*, 28, 85
Beræa, 20, 96
 — *articularis*, 96
 — *maurus*, 96
 — *pullata*, 96

- Beræodes*, 20, 96
 — *minuta*, 96
Bibio johannis, 80
 — *marci*, 80
 Black gnat, 80
 Blue-winged olive, 34-5, 84
 Books on *Ephemeridæ*, 12
 — *Trichoptera*, 12
Brachycentrus, 20, 93
 — *subnubilus*, 54-8, 93
 — — pupal grating of, 57
 Brown ant, 81

CADDIS flies, 40-69, 87-102

- Cænis*, 13, 85
 — *dimidiata*, 33, 85
 — *halterata*, 33-4, 85
 — *harrisella*, 33, 85
 — *rivulorum*, 33, 85^o
 Caperer, 47-8, 90
Capnia atra, 103
 — *nigra*, 103
 Cement for mounting insects in formalin cells, 5
Centroptilum, 14, 85
 — *luteolum*, 30-1, 85
 — *pennulatum*, 30-1, 85
Chælopteryx, 20, 91
 — *villosa*, 46-7, 91
 — — pupal grating of, 46
 Characters of the Families of the *Trichoptera*, 17-8
Chimarra, 20, 100
 — *marginata*, 66, 100
Chironomus tentans, 78
 — *viridis*, 78-9
Chloroperla grammatica, 70, 73-4, 103
 — *griseipennis*, 103
 Cinnamon sedge, 42-3, 88
 Claret dun, 38-9, 84
 Classification, 7
Cloëon, 14, 85
 — *dipterum*, 85
 — *simile*, 85
 — *rufulum*, 85
 Collecting fluid, 2
 — net, 1

- Collecting tubes, 2
 — water insects, 1-4
Colpotaulius, 20, 87
 — *incisus*, 87
Coxa, 10
Cruncæcia, 20, 93
 — *irrorata*, 93
Cyrnus, 20, 98
 — *flavidus*, 98
 — *trimaculatus*, 98
- DETERMINATION of species, 7
Diptectroma, 20, 97
 — *felix*, 97
Dipseudopsis, 19
Diptera, 71, 78-80
 Down-looker, 80
Drusus, 20, 91
 — *annulatus*, 91
 Dun, 22
- EARLY brown, 76, 104
 Eaton, the Rev. A. E., 12, 23-6
Ecclisopteryx, 20, 91
 — *guttulata*, 91
Ecdyurus, 14, 86
 — *lateralis*, 37, 86
 — *venosus*, 36, 86
 — *volitans*, 37, 86
Ecnomus, 20, 99
 — *tenellus*, 99
Enoicyla, 20, 91
 — *pusilla*, 91
Ephemera, 13, 23-8, 84
 — *danica*, 23-8, 84
 — *lineata*, 23, 26-7, 84
 — *vulgata*, 23-7, 82, 84
Ephemerella, 13, 84
 — *ignita*, 34-5, 84
 — *notata*, 84
Ephemeridæ, 22-39, 84-6
 — Mr. Eaton's notes on the, 12-15
 — works on the, 12
Erotosis, 20, 95
 — *baltica*, 95
 Examination of insects, lenses for the, 2
 Eyes of insects, 9
- FAMILY, a subdivision of an Order, 7
 Families in the *Trichoptera*, 16
 February red, 76-7, 104
Femur, 10
 Formalin solution, 2
- Genera, subdivisions of a Family, 7
 Glass blocks for mounting insects in formalin, 4
Glossosoma, 20, 101
 — *boltoni*, 69, 101
 — *vernale*, 68-9, 101
Glyphotælius, 20, 88
 — *pellucidus*, 88
Goëra, 20, 92
 — *pilosa*, 53, 92
 — — *palpi* of, 53
Grammotælius, 20, 88
 — *nitidus*, 88
 Grannom, 54-8, 93
 — eggs of, 56
 — larvæ of, 57
 — pupal grating of, 57
 Gravel bed, 79
 Great red spinner, 36
 Grey sedge, 59, 93
 Grouse wing, 63, 95
- Habrophlebia*, 13, 84
 — *fusca*, 84
Halesus, 20, 90
 — *auricollis*, 90
 — *digitatus*, 47-8, 90
 — *guttatipennis*, 90
 — *radiatus*, 47-8, 90
 Hawk, yellow, 37, 86
 Hawthorn fly, 80
 Head of insect, 8
Heptagenia, 14, 86
 — *flavipennis*, 86
 — *sulphurea*, 37-8, 86
Holocentropus, 20, 98
 — *dubius*, 98
 — *pivicornis*, 98
 — *stagnalis*, 98
 Hooks connecting wings of *Mystacides*, &c., 62
Hydropsyche, 20, 97
 — *angustipennis*, 97
 — *exocellata*, 97
 — *fulvipes*, 97
 — *guttata*, 63-4, 97
 — — wings of, 11
 — *instabilis*, 63, 97
 — *lepida*, 97
 — *ornatula*, 97
 — *pellucidula*, 63, 97
Hydropsychidæ, 16, 18, 97
Hydroptila, 20, 101-2
 — *angulata*, 102
 — *femoralis*, 102
 — *forcipata*, 102
 — *maclachlani*, 102
 — *occulta*, 102
 — *pulchricornis*, 102
 — *simulans*, 102
 — *sparsa*, 101
 — *sylvestris*, 102
 — *figurina*, 102
Hydroptilidæ, 16, 18, 101

- Imago of the Ephemeroidea*, 22
Inaequipalpia, 16, 87
 Iron-blue dun, 32-3, 85
 — spinner, 32-3, 85
Isogenus nubecula, 103
Isopteryx torrentium, 74, 103
 — *tripunctata*, 74, 103
Ithytrichia, 20, 102
 — *lamellaris*, 102
- JENNY spinner, 32
- Labial palpi*, 8
Labium, 8
Labrum, 8
 Large red sedge, 40, 87
Lasiocephala, 20, 93
 — *basalis*, 93
 Legs of insects, 10
 Lenses for the examination of
 insects, 2
Lepidostoma, 20, 93
 — *hirtum*, 58, 93
Leptis scolopacea, 80
Leptoceridae, 16, 17, 94
Leptocerus, 20, 94
 — *albifrons*, 61, 94
 — *alboguttatus*, 94
 — *annulicornis*, 94
 — *aterrimus*, 61, 94
 — *bilineatus*, 94
 — *cinereus*, 60-1, 94
 — *commutatus*, 94
 — *dissimilis*, 94
 — *fulvus*, 94
 — *nigronervosus*, 94
 — *senilis*, 94
Leptophlebia, 13, 84
 — *cincta*, 84
 — *marginata*, 39, 84
 — *submarginata*, 38, 84
 — *vespertina*, 38, 84
Leuctra albida, 104
 — *geniculata*, 70, 74-5, 104
 — *hippopus*, 75-6, 104
 — *inermis*, 104
 — *klapáleki*, 70, 74-5, 104
 — *nigra*, 104
Limnophilidae, 16, 17, 87
Limnophilus, 20, 88
 — *affinis*, 89
 — *auricula*, 89
 — *bipunctatus*, 89
 — *borealis*, 88
 — *centralis*, 88
 — *decipiens*, 88
 — *elegans*, 88
 — *extricatus*, 89
 — *flavicornis*, 88
 — *fuscicornis*, 89
 — *fuscinervis*, 88
 — *limnophilus*, 89
 — *lunatus*, 42-3, 88
 — — pupal grating of, 43
 — *luridus*, 89
 — *marmoratus*, 88
 — *nigriceps*, 88
 — *politus*, 88
 — *rhombicus*, 44, 88
 — — pupal grating of, 44
 — *sparsus*, 89
 — *stigma*, 88
 — *subcentralis*, 88
 — *vittatus*, 89
 — *xanthodes*, 88
 Lists of described British *Ephemeroidea*, *Trichoptera*, and *Perlidae*, 82-104
Lype, 20, 99
 — *fragilis*, 99
 — *phaeopa*, 99
 — *reducta*, 99
- McLACHLAN, R., 12, 19
Mandibles, 8
 March brown, 36, 86
Maxillae, 8
Maxillary palpi, 8, 16
 May-fly, 23-8, 84
Mesophylax, 20, 90
 — *aspersus*, 90
 — *impunctatus*, 90
Mesothorax, 9
Melathorax, 9
Micropterna, 20, 90
 — *lateralis*, 90
 — *sequax*, 90
Molanna, 20, 96
 — *angustata*, 96
 — *palpata*, 96
Molannidae, 16, 18, 96
 Mounting insects in formalin, 4-6
 Mouth parts of insects, 8
Myrmica laevinodis, 81
 — *rubra*, 81
Mystacides, 20, 95
 — *azurea*, 61, 95
 — *longicornis*, 63, 95
 — *nigra*, 61-2, 95
- NEEDLE fly, 104
Nemoura avicularis, 104
 — *cambrica*, 104
 — *cinerea*, 104
 — *dubitans*, 104
 — *inconspicua*, 70, 76, 104
 — *marginata*, 104
 — *meyeri*, 75-6, 104
 — *praecox*, 104
 — *standfussi*, 104

- Nemoura variegata*, 70, 76, 104
 Net, collecting, 1
Neureclipsis, 20, 97
 — *bimaculata*, 97
Neuronia, 20, 87
 — *clathrata*, 87
 — *ruficrus*, 87
Neuroptera, 16
Notidobia, 20, 92
 — *ciliaris*, 51-2, 92
Nymph, 22

 OAK fly, 80
Ocelli, 9
Oculi, 9
Odontoceridæ, 16, 17, 93
Odontocerum, 20, 93
 — *albicorne*, 59, 93
 — — antennæ of, 59-60
Ecetis, 20, 95
 — *furva*, 95
 — *lacustris*, 95
 — *notata*, 95
 — *ochracea*, 95
 — *testacea*, 95
 Olive dun, 28-9, 85
 — spinner, 28-9
Ommateum, 9
 Order, a subdivision of the insect kingdom, 7
Orthotrichia, 20, 102
 — *angustella*, 102
 — *telensii*, 102
Oxyethira, 20, 102
 — *costalis*, 102
 — *distinctella*, 102
 — *falcata*, 102
 — *frici*, 102
 — *mirabilis*, 102
 — *sagittifera*, 102
 — *simplex*, 102
 — *tristella*, 102

 PALE watery dun, 30-1, 85
 — — spinner, 30-1
Palpi, 8
Palpi of Goëra pilosa, 53
 — — *Sericostoma personatum*, 50
Perla cephalotes, 23, 72-3, 103
 — *marginata*, 103
 — *maxima*, 23, 72-3, 103
Perlidæ, 70-7, 103-4
Perloides microcephala, 70-2, 103
 — *recta*, 72, 103
Phacopteryx, 20, 89
 — *brevipennis*, 89
Philopotamidæ, 16, 18, 100
Philopotamus, 20, 100
 — *montanus*, 65, 100
Phryganea, 20, 87
 — *grandis*, 40-1, 87

Phryganea minor, 42, 87
 — *obsoleta*, 42, 87
 — *striata*, 40-1, 87
 — *varia*, 42, 87
Phryganeidæ, 16, 17, 87
Plectrocnemia, 20, 98
 — *brevis*, 98
 — *conspersa*, 98
 — *geniculata*, 98
Polycentropidæ, 16, 18, 97
Polycentropus, 20, 98
 — *flavomaculatus*, 64, 98
 — *kingi*, 64, 98
 — *multiguttatus*, 64, 98
Potamanthus, 13, 84
 — *luteus*, 84
 Preservation of insects, 1-6
 Preserving fluid, 2
Prothorax, 9
Psychomyia, 20, 99
 — *pusilla*, 99
Psychomyidæ, 16, 18, 99
 Pupal grating of *Brachycentrus subnubilus*, 57
 Pupal grating of *Chætopteryx villosa*, 46
 Pupal grating of *Limnophilus lunatus*, 43
 Pupal grating of *Limnophilus rhombicus*, 44
 Pupal grating of *Sericostoma personatum*, 51
Pulvillus, 10

 RED spinner, 29
Rhithrogena, 14, 86
 — *semicolorata*, 38, 86
Rhyacophila, 20, 100
 — *dorsalis*, 66-7, 100
 — *munda*, 100
 — *obliterata*, 100
 — *septentrionis*, 100
Rhyacophilidæ, 16, 18, 100

 SENDING insects by post, 3
Sericostoma, 20, 92
 — *analisis*, 49, 92
 — *multiguttatum*, 49, 92
 — *personatum*, 49-51, 92
 — — pupal grating of, 51
Sericostomatidæ, 16, 17, 92
Setæ, 12
Setodes, 20, 96
 — *argentipunctella*, 96
 — *interrupta*, 96
 — *punctata*, 96
 — *tineiformis*, 96
 Sherry spinner, 34-5
Sialidæ, 71, 77
Sialis fuliginosa, 77
 — *lutaria*, 77

- Silo*, 20, 92
 — *nigricornis*, 53-4, 92
 — — legs of, 21
 — *pallipes*, 54, 92
 Silverhorns, black, 61-2, 94-5
 — brown, 60-1, 94
Siphylurus, 14, 86
 — *lacustris*, 86
 Species of insects, subdivisions of
 Genera, 7
 Spent gnat, 28
 Spinner, 22
 Spurs, 10, 19, 20
Stenophylax, 20, 89
 — *alpestris*, 89
 — *dubius*, 89
 — *infumatus*, 89
 — *latipennis*, 90
 — *permistus*, 90
 — *rotundipennis*, 89
 — *stellatus*, 48, 90
 — *vibex*, 90
 Stone fly, 23, 70, 72-3, 103
 Sub-imago, 22

Tæniopteryx nebulosa, 76-7, 104
 — *putata*, 104
 — *risi*, 77, 104
Tarsus, 10
Thorax, 9
Tinodes, 20, 99
 — *assimilis*, 99

Tinodes aureola, 99
 — *dives*, 99
 — *maculicornis*, 99
 — *unicolor*, 99
 — *wæneri*, 99
Triænodes, 20, 95
 — *bicolor*, 95
 — *conspersa*, 95
 — *reuteri*, 95
Trichoptera, 16, 40-69, 87-102
 — Books on the, 12
Trochanter, 10
 Turkey brown, 38, 84

 ULMER, George, System of Classification, 17

 VARNISH for formalin cells, 6

 WELSHMAN'S button, 49-51, 92
 Willow fly, 70, 74-5, 104
 Wings, 9-11
 Wings of *Hydropsyche guttata*, 11
Wormaldia, 20, 100
 — *mediana*, 100
 — *occipitalis*, 100
 — *subnigra*, 100

 YELLOW hawk, 37, 86
 — may dun, 37, 86
 — sally, 70, 73-4, 103
 — upright, 38, 86

The following pages are left blank for readers' notes, and a few blank plates are inserted for sketches.



NOTES

NOTES

NOTES

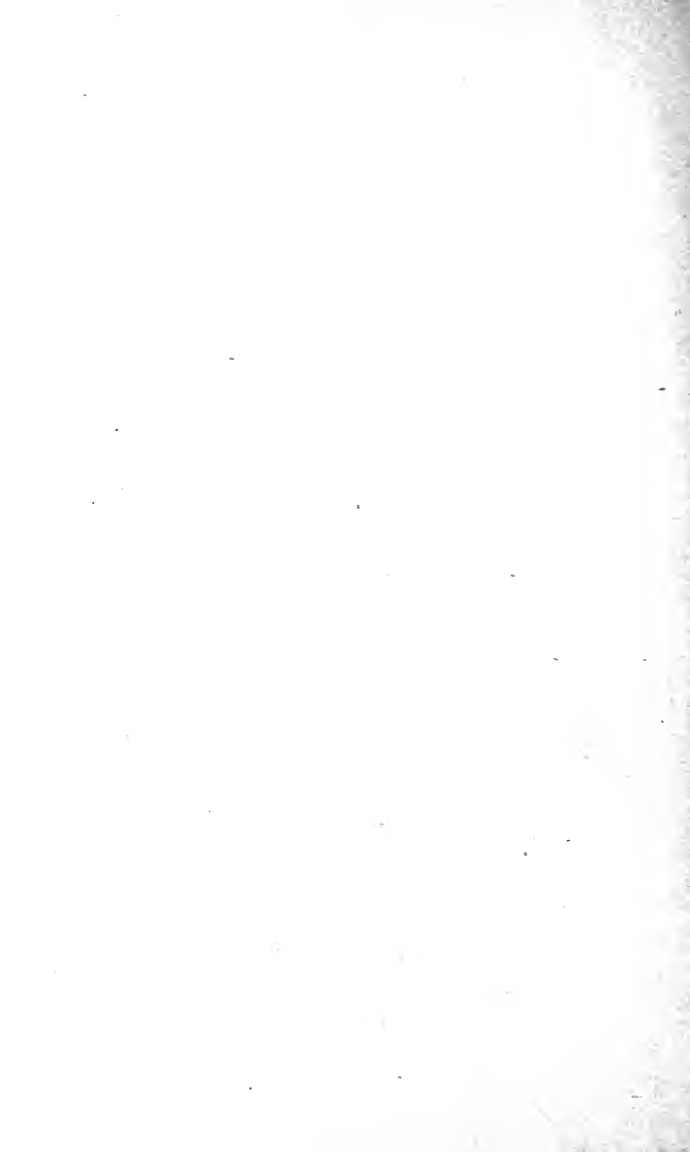
NOTES



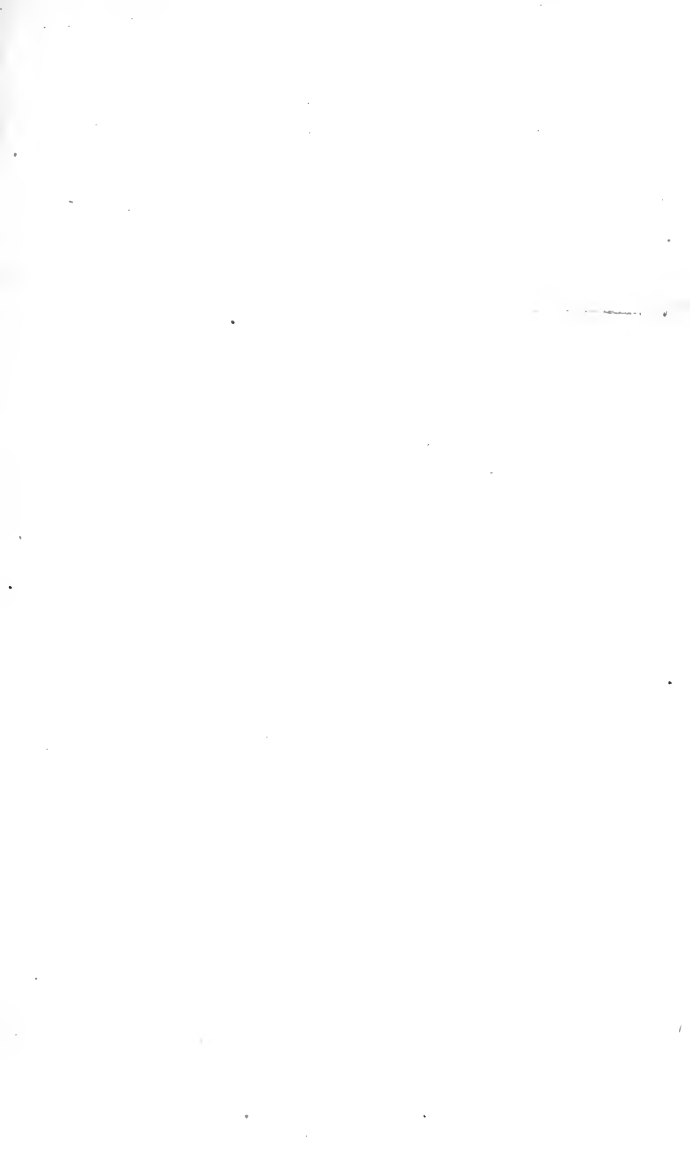












FOURTEEN DAY USE

RETURN TO DESK FROM WHICH BORROWED

This book is due on the last date stamped below, or
on the date to which renewed.

Renewed books are subject to immediate recall.

16 Dec '55 GG

DEC 16 1955 LU

LIBRARY USE

FEB 2 1963

REC'D LD

FEB 2 1963

YA 03547

