## Contents

Foreword	ix
Preface	xi
Acknowledgements	xi
Introduction	1
History and background of vector control	1
Alternatives to the use of insecticides	1
Reorganization of vector control	2
Vector control at community level	2
Selecting the appropriate control measures	2
Self-protection Self-protection	3
Community control	3
Chapter 1 Mosquitos and other biting Diptera	
Biology	7
Distinguishing features of biting Diptera	7
Mosquitos	10
Blackflies	17
Sandflies	20
Biting midges	21
Horseflies and deerflies (tabanids)	22
Stable flies	24
Public health importance	24
Nuisance	24
Malaria	25
Lymphatic filariasis	29
Mosquito-borne viral diseases	33
Onchocerciasis (river blindness)	41
Leishmaniasis	45
Mansonellosis	51
Loiasis	52
Tularaemia	52
Control measures	52
Selecting the most appropriate control measures	52
Personal protection	54
Repellents	54
Protective clothing	59
Insecticide vaporizers	63
Protection measures in hammocks	71
Suggestions for protection in the absence of a mosquito net	72
Mosquito nets	73
Treating fabrics with an insecticide	85

iv CONTENTS

Insecticides	85
Optimal combination of mosquito net materials and	03
pyrethroids	87
Recommended dosages	87
Safety measures	88
Safety of treated nets	88
How to prepare the appropriate solution and treat and dry	
the fabric	88
When to re-treat	95
Disposal of insecticide	98
Making houses and shelters insect-proof	98
House design	99
Anti-mosquito screening	99
Protection measures for tents	103
Treated sheeting for temporary shelters	104
Avoidance and diversion of biting Diptera	105
Avoidance	105
Diversion to animals	105
Insecticide spraying	106
Insecticide spraying of walls	106
Space-spraying with insecticides	110
Prevention of breeding	112
Source reduction	113
Biological control	122
Larvicides	128
Habitats in and around houses	137
Habitats in the field	155
References	164
Selected further reading	176
Slide sets for training in vector biology and control	177
Chapter 2 Tsetse flies	
Biology	178
Life cycle	178
Resting places	178
Food	180
Public health importance	180
Sleeping sickness	180
Control measures	185
Traps and insecticide-impregnated screens	185
Mode of action and design	185
Models of traps and screens	186
Placement	189
Maintenance	195
Assembly	195
Impregnation	203
Insecticide spraying	206
Ground spraying	206
Aerial spraying	208
References	208

Chapter 3 Triatomine bugs	
Biology	210
Life cycle	210
Behaviour	210
Resting places	210
Public health importance	213
Nuisance	213
Chagas disease	213
Control measures	216
Application of insecticides to house walls	217
Insecticides	218
Slow-release formulations (insecticidal paints)	218
Determination of residual activity	221
House improvement	222
Existing houses	222
New houses	226
Improvement of the peridomestic environment	228
Impregnated mosquito nets	228
Fumigant canisters	230
Use	230
Safety	232
Surveillance	232
Surveillance methods	232
References	235
Chapter 4 Bedbugs, fleas, lice, ticks and mites	225
Bedbugs	237
Biology	237
Dispersal	238
Public health importance	239
Control measures	239
Detection	239
Repellents	239
Simple household measures	239
Impregnated mosquito nets	240
Smoke generators	240
Residual insecticides	241
Fleas	243
Biology	243
Behaviour	244
Public health importance	245
Nuisance	245
Plague	245
Flea-borne typhus	246
Other diseases	246
Control measures	246
Fleas as a nuisance	247
Fleas that transmit diseases	249
Sand fleas or jigger fleas	251
Biology	251
Public health importance	251

Lice	253
Biology	254
Body lice	255
Head lice	255
Crab or pubic lice	255
Public health importance	257
Nuisance	257
Louse-borne typhus fever	257
Louse-borne relapsing fever	258
Trench fever	258
Control measures	259
Head lice	259
Crab or pubic lice	261
Body lice	262
Ticks	263
Biology	263
Soft ticks	264
Hard ticks	265
Public health importance	268
Nuisance	268
Tick-borne relapsing fever	268
Tick paralysis	268
Tick-borne rickettsial fevers	268
Lyme disease	269
Tularaemia	270
Tick-borne viral encephalitides	271
Other viral diseases	272
Control measures	272
Self-protection	272
Community protection	274
Mites	275
Biting mites	276
Biology	276
Public health importance	277
Control measures	278
Scabies mite	279
Biology	279
Public health importance	280
House dust mite	282
Prevention and control	282
References	283
Chapter 5 Cockroaches	
Biology	288
Life cycle	288
Behaviour	290
Dispersal	291
Public health importance	291
Nuisance	291
Diseases	291

Control measures	292
Environmental management	293
Cleanliness and hygiene	293
Reduction of accessibility	293
Chemical control	293
Resistance	294
Application	294
Baits and traps	299
Repellents	300
References	300
Chapter 6 Houseflies	
Biology	302
Life cycle	302
Food	302
Breeding sites	304
Ecology of adult flies	305
Public health importance	306
Nuisance	306
Diseases	306
Control measures	308
Improvement of environmental sanitation and hygiene	308
Reduction or elimination of fly breeding sites	308
Reduction of sources that attract flies from other areas	310
Prevention of contact between flies and disease-causing	
germs	311
Protection of food, eating utensils and people from contact	
with flies	311
Methods of killing flies directly	312
Physical methods	312
Chemical methods	314
Reference	323
Selected further reading	323
Chapter 7 Cyclops	204
Biology	324
Public health importance	324
Guinea-worm disease	324
Control measures	332
Prevention of patient-water contact	332
Installation of safe drinking-water supplies	332
Filtration of drinking-water	332
Chemical control	334
Boiling of drinking-water	336
References	336
Chapter 8 Freshwater snails	227
Biology	337
Life cycle Ecology	337
H CO LOCAL	338

Schistosomiasis	340
Foodborne trematode infections	348
Control measures	350
Avoidance of contact with snail-infested waters	350
Improved sanitation	350
Snail control	350
Environmental management	352
Removal and destruction	352
Biological control	353
Chemical control	353
References	356
Selected further reading	356
Chapter 9 House-spraying with residual insecticides	
Problems with house-spraying in malaria control programmes	357
Organization of spraying	358
Insecticides for residual spraying	359
Characteristics of good residual insecticides	360
Resistance	360
Formulations	360
Dosages and cycles	362
Type of sprayed surface	363
Commonly used insecticides	363
Preparation of insecticide suspension	366
Manually operated sprayers	367
Compression sprayers	369
Spraying operations	381
Where to spray	381
When to spray	381
References	383
Selected further reading	384
Chapter 10 Safe use of pesticides	
Precautions	385
The label	385
Storage and transport	385
Disposal	385
General hygiene	388
Protective clothing	389
Safe techniques	391
Emergency measures	393
Signs and symptoms of poisoning	393
First-aid treatment	394
Further treatment	397
References	397
Selected further reading	397
Index	308