Fish Pheromones and Related Cues
Fish Pheromones and Related Cues

Edited by

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This book is dedicated to Kjell B. Døving (1936–2014), a pioneer in the study of fish olfaction and pheromones, who passed away a few months after finishing his chapter.
## Contents

*Contributors* ix  
*Preface* xi

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Pheromones and Related Chemical Cues in Fishes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Peter W. Sorensen</em></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Species-Specific Pheromones and Their Roles in Shoaling, Migration,</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>and Reproduction: A Critical Review and Synthesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Peter W. Sorensen and Cindy Baker</em></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hormonally Derived Pheromones in Teleost Fishes</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td><em>Norm Stacey</em></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Conspecific Odors as Sexual Ornaments with Dual Functions in Fishes</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td><em>Lynda D. Corkum and Karen M. Cogliati</em></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Intraspecific Social Recognition in Fishes via Chemical Cues</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td><em>Ashley J.W. Ward</em></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Chemical Cues That Indicate Risk of Predation</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td><em>Brian D. Wisenden</em></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The Cue–Signal Continuum: A Hypothesized Evolutionary Trajectory for</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>Chemical Communication in Fishes</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Brian D. Wisenden</em></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Olfactory Discrimination of Pheromones</td>
<td>159</td>
</tr>
<tr>
<td></td>
<td><em>Stine Lastein, El Hassan Hamdani and Kjell B. Døving</em></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Measuring and Identifying Fish Pheromones</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td><em>Michael Stewart and Peter W. Sorensen</em></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Effects of Pollutants on Olfactory Detection and Responses to Chemical</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td>Cues Including Pheromones in Fish</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>K. Håkan Olsén</em></td>
<td></td>
</tr>
<tr>
<td>Chapter 11</td>
<td>Pheromones in Marine Fish with Comments on Their Possible Use in Aquaculture</td>
<td>237</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td><em>Peter Hubbard</em></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 12</th>
<th>Applications of Pheromones in Invasive Fish Control and Fishery Conservation</th>
<th>255</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Peter W. Sorensen</em></td>
<td></td>
</tr>
</tbody>
</table>

| Afterword | 269 |
| Index | 271 |

Color plates appear between pages 144 and 145.
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Preface

It has been known for at least a century that fish, the largest and most diverse group of vertebrates, are strongly influenced by chemicals that they themselves release into the water. Some of these stimuli seem to be discerned by innate mechanisms by all members of their species and are called “pheromones”. Other types of related organismal chemical cues appear to have less prescribed actions and may at times be learned. Together, these cues play profound and varied roles in the lives of fish, ranging from avoiding danger to synchronizing reproduction. This book, the first on fish pheromones and related cues, reviews all aspects of conspecific chemical cues in fish. It adopts a broad, systems-level approach to encourage new integrative thinking.

The first chapter was written by the primary editor to define terms and provide common language for the entire book. A second set of chapters reviews how conspecific chemical cues are used by fishes. Both pheromones and related conspecific cues that may be learned are addressed because the distinction can be vague. A third set of chapters addresses mechanisms of pheromone detection and production as well our detection mechanisms. Lastly, applications in fisheries management and culture are addressed. An afterword summarizes some key points and future directions.

A wide range of authors have generously contributed to this book which I hope will invigorate the field and stimulate another book in the near future.

Peter W. Sorensen
Chapter 1
Introduction to Pheromones and Related Chemical Cues in Fishes

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1.1 CHEMICAL INFORMATION TRANSFER IN FISH
Information transfer between fishes, the largest and most diverse group of vertebrates, has long been both of practical importance and a source of wonder given the evolutionary, ecological, and economic importance of this group. Chemicals play an especially significant role in this process, presumably because they function well in vast dark spaces, can encode a great deal of information, are readily soluble, and are inherently “honest.” This book specifically addresses how and why chemical information is transferred between fishes of the same species. First I define some basic terminology to promote clarity and then I introduce some other terms, types of chemical cues, and principals along with the chapters which discuss them. Information transfer between different species is not explicitly addressed except how it might occur as part of transfer within a species. This section introduces these terms and issues, and then where more information on them can be found in the book.

1.2 TERMINOLOGY

1.2.1 Overview
Because the terminology used to describe conspecific cues has been used in many ways since the term “pheromone” was first coined 50 years ago (Karlson and Luscher, 1959), I suggest and define some terms in this introductory section to provide clarity. Definitions were chosen for practical reasons and to be consistent with those used by researchers outside the world of fishes. Emphasis is placed on recent work by Tristram Wyatt (2003, 2010). Authors were asked to consider the terminology suggested herein, but not necessarily to use it if their opinions differed. Information transfer between members of different species (kariomones) is not directly addressed in this book.

1.2.2 Pheromones
Following Tristram Wyatt (2010), a “pheromone” may be defined as: “molecules that are evolved cues which elicit a specific reaction, for example a stereotyped behavior and/or development process in a conspecific.” This definition is closely based on the original definition by Karlson and Luscher (1959). Key elements are that pheromones are “evolved cues” (stimuli whose production is in some