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An indexed bibliography on the common shrimp,
Crangon crangon (L.), complementary to Tiews, 1967.

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Abstract.

An indexed bibliography on the shrimp *Crangon crangon* (L.), complementary to Tiews' "Synopsis of Biological Data on the Common Shrimp" (1967) is presented. It covers about 560 papers on a variety of topics such as taxonomy, morphology, anatomy, zoogeography, biochemistry, physiology, reproduction biology, metabolism, ethology, ecology, exploitation, management and culture of the brown shrimp. The bibliography is followed by an index of key-word entries to the literature. Some major trends in the scientific research on the brown shrimp are summarized.

Résumé.

Un index bibliographique sur la crevette *Crangon crangon* (L.), complémentaire au "Synopsis of Biological Data on the Common Shrimp" par Tiews (1967) est présenté. L'index contient environ 560 contributions, traitant sur la taxonomie, la morphologie, l'anatomie, la zoogéographie, la biochimie, la physiologie, la reproduction, le métabolisme, l'éthologie, l'écologie, l'exploitation, la gestion et la culture de la crevette grise. La bibliographie est suivie par une liste de mots-clés, donnant accès à la littérature. Les tendances les plus importantes dans les recherches scientifiques sur la crevette grise sont résumées.

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1. Introduction.

Since Tiews published his "Synopsis of Biological Data on the Common Shrimp, Crangon crangon (Linnaeus, 1758)" (TIEWS, 1967) the scientific literature on the brown shrimp swell to enormous proportions. Tiews' bibliography, covering the literature until 1967, included nearly 120 titles ; since then over 400 new scientific contributions dealing exclusively or amongst other animal species, with the brown shrimp have been written.

The literature on Crangon crangon grows in an almost exponential way : around 10 papers per decennium in the period 1891-1920, 10 to 30 papers per decennium in the period 1921-1950, almost 70 papers in the fifties, nearly 200 in the sixties and over 350 in the seventies.

Prior to 1940 the literature mainly treated the natural history of the brown shrimp (reproduction biology, migrations, growth,...). From 1940 onwards an increasing number of contributions on physiological and biochemical aspects of the shrimp's biology, especially on osmoregulation, pigmentation, food requirements and utilization, was published. About fifteen years later marine biologists showed a steadily growing interest in the exploitation and management problems of the shrimp fisheries (the by-catch problem, gear design, the possible overfishing of the shrimp stocks, stock management,...). This trend was rapidly followed by a more ecological approach of the shrimp's population dynamics (the impact of predation, the rôle of the brown shrimp in the ecosystem,...). Finally, from the mid-sixties onwards, an almost endless flood of papers on the impact of pollution and pollutants was produced. Not so much because the brown shrimp was endangered but merely because, "for routine testing, the mortality of the readily available species of brown shrimp (Crangon crangon) was selected as the effect to be measured" (BLACKMAN and colleagues, 1978, pag. 235).

Notwithstanding these major trends the study of fundamental aspects of the shrimp's natural history, physiology and behaviour was continued. Partly because our knowledge on several of these aspects (e.g. growth, age, migration, metabolism,...) shows serious contradictions, partly because the available data are insufficient to produce ready to hand explanations for ecological and pollution-induced phenomena.

This brief historical review shows that at least an important part of the scientific work on Crangon crangon closely fits the "spirit of the times" and the changing social, political and economic concerns and interests. However, one main rapid seems to have left the Crangon-biologists relatively unaffected : up to now only a few (rather unsuccessful) attempts have been made to rear or culture the brown shrimp.

2. Scope of the bibliography.

This bibliography covers the literature on a variety of topics such as taxonomy, morphology, anatomy, zoogeography, biochemistry, physiology, reproduction biology, metabolism, ethology, ecology, exploitation, management and culture of Crangon crangon. It includes about 560 titles : 440 published since 1967 and about 120 not yet included in Tiews' review. However, papers on the food and food composition of predatory fishes, where Crangon is mentioned as a prey item, and papers on the processing, preservation and marketing of shrimps were omitted. A partial bibliography on the first topic can be found in REDANT (1978).

Even within these confines several restrictions and criteria had to be respected :

- a. books and general reviews were excluded,
- b. publications of a non-scientific or a journalistic nature were excluded,
- c. periodical contributions by international or governmental organizations on catch and landing statistics were excluded,
- d. periodical publications by institutes or individual scientists on cooperative stock surveys were excluded,
- e. unpublished reports, theses, etc. were included solely when they were not yet published in any other form,
- f. similar or identical contributions published under different forms (e.g. as an ICES-paper and in the "open" literature) were grouped under the same serial number. All the references are given but the title is not repeated.

The references have been selected from different sources, the main ones being :

- a. the compiler's personal reference system,

- b. other bibliographies and current abstracts,
- c. scientific periodicals,
- d. collected reprints from scientific institutes,
- e. proceedings of conferences and symposia,
- f. specialized books,
- g. references from the papers themselves.

A particular effort has been made to cover the literature on Mediterranean Crangon crangon which, apparently, is not readily available to North Sea scientists. Publications which were not seen by the compiler are marked with an asterisk.

The bibliography is followed by an index of key-word and key-item entries to the literature. The choice of these keys was based on Tiews' Synopsis to make the two reference lists as compatible as possible. The key-words and -items are classified under the following headings : Identity, Distribution, Reproduction, Hardiness, Nutrition and Growth, Behaviour, Population, Exploitation and Management and Culture.

Unavoidably a project like this one will be incomplete and imperfect. Therefore any comments, corrections and additions will be welcomed by the compiler.

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P.1. Population structure and composition

P.1.1. Age and length composition

070 - 076 - 085 - 086 - 087 - 088 - 091 - 151 - 175 - 237 - 268
287 - 302 - 323 - 342 - 355 - 407 - 436 - 494 - 509 - 510

P P.1.1. Age and length composition (continued)

Cross references : D.2.1. - B.1.

P.1.2. Sex ratio

175 - 218 - 290 - 323

Cross references : D.2.1. - R.1.

P.2. Abundance, density and biomass

Larvae : 062 - 070 - 072 - 088 - 110 - 374
Adults : 027 - 037 - 043 - 044 - 045 - 046 - 054 - 070 - 084 - 085 - 108
109 - 150 - 152 - 153 - 155 - 165 - 237 - 246 - 287 - 323 - 359
388 - 389 - 403 - 404 - 405 - 406 - 407 - 409 - 452 - 465 - 488
494 - 510 - 511 - 512 - 513 - 514 - 515 - 516 - 517 - 560

Cross references : D.2.1. - B.1. - P.6.1.

P.3. Natality and recruitment

006 - 008 - 040 - 060 - 067 - 083 - 084 - 085 - 087 - 165 - 175
179 - 221 - 237 - 263 - 287 - 359 - 407 - 409 - 494 - 510 - 556
558

Cross references : R.1.-5. - D.2.1.

P.4. Mortality

P.4.1. Predation mortality

Adults : 070 - 076 - 081 - 082 - 085 - 087 - 088 - 103 - 152 - 237 - 240
263 - 264 - 287 - 303 - 306 - 342 - 359 - 400 - 406 - 407 - 408
409 - 410 - 436 - 471 - 473 - 481 - 488 - 493 - 494

Cross reference : H.4.

P.4.2. Other natural mortality

Adults : 018 - 045 - 057 - 287 - 335 - 337 - 339 - 406 - 407 - 409 - 411
Cross references : H.1. - H.2. - H.3. - H.5.

P.4.3. Fishing mortality

083 - 086 - 087 - 240 - 243 - 263 - 264 - 306 - 406 - 407 - 409
436 - 473 - 477 - 488 - 493 - 494

Cross references : E.4.1. - E.4.2.

P.4.4. Other man-made mortality

See : H.6. Pollution and pollutants

H.7. Impact of man-made perturbations, others than fisheries and pollution

P P.5. Population dynamics

P.5.1. Changes in population size and structure

006 - 007 - 057 - 070 - 072 - 075 - 076 - 079 - 080 - 081 - 083
084 - 086 - 087 - 088 - 152 - 237 - 240 - 263 - 264 - 342 - 389
400 - 403 - 406 - 407 - 409 - 410 - 436 - 465 - 488 - 493 - 494
510 - 556

Cross references : P.3. - P.4.

P.5.2. Models of population dynamics

086 - 087 - 237 - 263 - 264 - 287 - 406 - 407 - 409 - 436 - 494

P.6. The population in the community and ecosystem

P.6.1. Community structure and composition

Larvae : 110 - 284 - 285 - 286
Adults : 008 - 013 - 017 - 026 - 027 - 029 - 043 - 044 - 045 - 046 - 054
108 - 109 - 116 - 117 - 118 - 119 - 137 - 159 - 170 - 171 - 172
173 - 174 - 191 - 195 - 196 - 198 - 290 - 294 - 295 - 296 - 307
308 - 309 - 311 - 324 - 326 - 331 - 348 - 349 - 359 - 397 - 401
402 - 405 - 406 - 407 - 419 - 420 - 421 - 422 - 435 - 528 - 552
557 - 558 - 560

Cross references : H.3. - H.4. - P.6.2.

P.6.2. Community dynamics

Adults : 006 - 008 - 018 - 026 - 027 - 028 - 029 - 041 - 043 - 045 - 046
109 - 213 - 214 - 324 - 331 - 359 - 396 - 397 - 406 - 407 - 409
420 - 421 - 422 - 452 - 493 - 549 - 556 - 558

Cross reference : P.6.1.

E E. EXPLOITATION and MANAGEMENT

E.1. Fishing gear

E.1.1. Descriptions of existing gear

025 - 038 - 073 - 074 - 097 - 126 - 127 - 128 - 131 - 156 - 157
162 - 199 - 209 - 222 - 241 - 282 - 304 - 323 - 394 - 395 - 464
474 - 520

Cross reference : E.5.2.

E.1.2. Gear design

025 - 042 - 074 - 100 - 101 - 102 - 111 - 158 - 203 - 263 - 264
289 - 350 - 497 - 498 - 499 - 500 - 501 - 503 - 504 - 505

Cross reference : E.5.2.

E E.2. Fishing boats and operations

071 - 073 - 094 - 126 - 127 - 128 - 129 - 130 - 131 - 202 - 209
222 - 282 - 303 - 304 - 321 - 502 - 520

E.3. Fishing areas and seasons

024 - 061 - 073 - 093 - 150 - 153 - 162 - 200 - 209 - 222 - 241
244 - 253 - 254 - 263 - 264 - 278 - 280 - 282 - 303 - 306 - 322
323 - 326 - 359 - 423 - 494 - 523

Cross references : B.1. - P.2.

Cf. remarks on the scope of the bibliography

E.4. Results of fishing operations

E.4.1. Effort, catches and landings

024 - 058 - 059 - 060 - 061 - 066 - 068 - 069 - 070 - 072 - 073
075 - 081 - 082 - 086 - 088 - 093 - 149 - 150 - 152 - 153 - 162
164 - 188 - 209 - 222 - 240 - 241 - 242 - 243 - 244 - 253 - 254
263 - 264 - 278 - 303 - 305 - 306 - 321 - 322 - 323 - 340 - 341
342 - 344 - 345 - 346 - 357 - 359 - 403 - 407 - 410 - 436 - 473
475 - 476 - 478 - 479 - 480 - 482 - 483 - 484 - 485 - 486 - 487
488 - 489 - 490 - 491 - 492 - 493 - 494 - 526

Cf. remarks on the scope of the bibliography

E.4.2. By-catch : foddershrimps

025 - 042 - 058 - 059 - 060 - 061 - 062 - 068 - 069 - 071 - 074
075 - 081 - 089 - 156 - 157 - 240 - 241 - 242 - 243 - 263 - 264
278 - 306 - 345 - 346 - 359 - 436 - 475 - 476 - 478 - 479 - 480
482 - 483 - 484 - 485 - 486 - 487 - 489 - 490 - 491 - 492 - 493
494 - 502

Cf. remarks on the scope of the bibliography

E.4.3. By-catch : commercial fish species

019 - 022 - 025 - 042 - 058 - 068 - 071 - 074 - 089 - 090 - 111
149 - 156 - 157 - 216 - 240 - 259 - 263 - 264 - 273 - 274 - 280
289 - 304 - 305 - 340 - 343 - 345 - 346 - 350 - 399 - 471 - 475
476 - 473 - 479 - 480 - 482 - 483 - 484 - 485 - 486 - 487 - 489
490 - 491 - 492 - 493 - 500 - 501 - 504

Cf. remarks on the scope of the bibliography

E.4.4. By-catch : other species

022 - 042 - 111 - 156 - 157 - 263 - 266 - 302 - 305 - 346 - 350
401 - 402 - 480 - 487 - 493

E.4.5. Catch forecasting

060 - 062 - 066 - 076 - 081 - 088 - 180 - 181