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Public Health Microbiology

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Nanoparticles Functionalized with Ampicillin Destroy Multiple-Antibiotic-Resistant Isolates of Pseudomonas aeruginosa and Enterobacter aerogenes and Methicillin-Resistant Staphylococcus aureus
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Vibrio parahaemolyticus in Rhode Island Coastal Ponds and the Estuarine Environment of Narragansett Bay
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**Isolation, characterization, and quantification of Clostridium kluyveri from the bovine rumen**  
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**Synthesis and characterization of the antibacterial potential of ZnO nanoparticles against extended-spectrum β-lactamases-producing Escherichia coli and Klebsiella pneumoniae isolated from a tertiary care hospital of North India**  
Mohammad Azam Ansari, Haris M. Khan, Aijaz A. Khan, Asfia Sultan and Ameer Azam

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Research articles

Review

A laboratory guide to in vitro fertilization of oceanic squids
Roger Villanueva, Danna J. Staaf, Juan Argüelles, Anna Bozzano, Susana Camarillo-Coop, Chingis M. Nigmatullin, Giuliano Petroni, Daniel Quintana, Mitsuo Sakai, Yasunori Sakurai, César A. Salinas-Zavala, Roxana De Silva-Dávila, Ricardo Tafur, Carmen Yamashiro, Erica A.G. Vidal

We outline a generalized laboratory protocol for fertilization of oceanic squid. Adequate chorion expansion is a major challenge for in vitro fertilization. Techniques described here refine and standardize the general methodology. In vitro fertilization creates new opportunities to develop cephalopod culture.

Diseases

Dietary nicarbazin reduces prevalence and severity of Kudoa thyrsites (Myxosporea: Multivalvulida) in Atlantic salmon Salmo salar post-smolts
Simon R.M. Jones, Ian Forster, Xiangjun Liao, Michael G. Ikonomou

Dietary nicarbazin reduced levels of Kudoa thyrsites in Atlantic salmon smolts. Nicarbazin residues in muscle and liver were proportional to concentration in diet. Nicarbazin caused mortality, reduced appetite and discoloration in some fish. Adverse effects ceased following cessation of dietary treatment.

Recovery and pathogenicity analysis of Aerococcus viridans isolated from tilapia (Oreochromis niloticus) cultured in southwest of China
Xiaoli Ke, Maixin Lu, Xing Ye, Fengying Gao, Huaping Zhu, Zhanghan Huang

Identification of a new pathogen from tilapia. A. viridans lead to disease outbreak in tilapia farm. A. viridans cause histopathological changes in tilapia.

Antibiograms and the estimation of epidemiological cut off values for Vibrio ichthyoventeri isolated from larval olive flounder, Paralichthys olivaceus
Deok-Chan Lee, Hyun-Ja Han, Shin-Young Choi, Göran Kronvall, Chan-Il Park, Do-Hyung Kim

We determined MIC for 35 strains of Vibrio ichthyoventeri to nine antimicrobials. Wild type cut off (COwt) values for six antibiotics were calculated using NRI method.
derived CO\textsubscript{wt} values in this study can be used as epidemiological cut off values. ▶ Repeated doses of some antibiotics appeared to induce high occurrences of resistance.

**Vaccination effect of liposomes entrapped whole cell bacterial vaccine on immune response and disease protection in *Epinephelus bruneus* against *Vibrio harveyi***
Ramasamy Harikrishnan, Ju-Sang Kim, Chellam Balasundaram, Moon-Soo Heo

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**Highlights**
- The cumulative mortality was 25% in liposome-entrapped WCV immunized fish.
- Total protein significantly increased in liposome-entrapped WCV or WC alone.
- The antibody titres significantly increased in liposome-entrapped WCV.
- The phagocytic activity significantly enhanced in all immunized groups on week 4.
- The lysozyme activity significantly enhanced in all immunization groups from weeks 1 to 4.

**Genetics**

**Quantitative genetics of body weight, fillet weight and fillet yield in Nile tilapia (*Oreochromis niloticus*)**
Bjarne Gjerde, Samuel Bekele Mengistu, Jørgen Ødegård, Harry Johansen, Danilo Soza Altamirano

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**Highlights**
- Fillet weight and body weight have close to unity genetic correlation.
- Unlikely to improve fillet weight beyond the gain through selection for body weight.
- Selection for increased fillet yield is not likely to be successful.
- Still, fillet yield is expected to increase with body weight.
- Increased fillet yield may not be observed if harvested at a younger age.

**Nutrition**

**Effects of water temperature and Na\textsuperscript{+}:K\textsuperscript{+} ratio on physiological and production parameters of *Litopenaeus vannamei* reared in low salinity water**

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**Highlights**
- We studied effects of temperature and Na\textsuperscript{+}:K\textsuperscript{+} ratio on the performance of shrimp.
- We observed negative effects of high aqueous Na\textsuperscript{+}:K\textsuperscript{+} ratio on shrimp performance.
- Strong sensitivity of shrimp survival to Na\textsuperscript{+}:K\textsuperscript{+} ratio occurred at low temperature.

**Improving the survival, growth and hemolymph ion maintenance of early juvenile blue swimmer crabs, *Portunus pelagicus*, at hypo- and hyper-osmotic conditions through dietary long chain PUFA supplementation**
Nicholas Romano, Chaoshu Zeng, Noordiyana Mat Noordin, Wing-Keong Ng

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**Highlights**
- Increased dietary fish oil improved *Portunus pelagicus* growth at extreme salinities.
- Better growth is likely linked with improved hemolymph ion maintenance.
- Optimal LC-PUFA requirements of *P. pelagicus* are provided.
Effects of dietary chitosan oligosaccharides and *Bacillus coagulans* on the growth, innate immunity and resistance of koi (*Cyprinus carpio koi*)
Shimei Lin, Shuhong Mao, Yong Guan, Lin Luo, Li Luo, Yu Pan

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**Highlights**
- We investigate the efficacy of COS and *B. coagulans* on koi.
- The COS and *B. coagulans* could enhance the growth and the immune responses.
- The COS and *B. coagulans* had a synergistic effect on enhancing immunity of koi.
- No differences in growth and the immune responses between COS and *B. coagulans*.

Effects of dietary L-carnitine, plant proteins and lipid levels on growth performance, body composition, blood traits and muscular carnitine status in juvenile silver perch (*Bidyanus bidyanus*)
Shuenn-Der Yang, Fu-Guang Liu, Chyng-Hwa Liou

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**Highlights**
- This study was aimed at the effects of adding dietary L-carnitine on silver perch.
- Added dietary L-carnitine notably enhanced growth and feed utilization of the fish.
- The low-fishmeal, low-fat diet with L-carnitine led to less ammonia excretion.
- L-carnitine added diets reduced intraperitoneal fat ratio and body lipid contents.

Growth and apparent digestibility of nutrients, fatty acids and amino acids in Pacific white shrimp, *Litopenaeus vannamei*, fed diets with rice protein concentrate as total and partial replacement of fish meal
Amin Oujifard, Jafar Seyfabadi, Abdolmohammad Abedian Kenari, Masoud Rezaei

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**Highlights**
- RPC can be used with an inclusion level of up to 50% in *L. vannamei* diet.
- Replacing above 50% inclusion resulted in an almost linear reduction in the ADCs of the nutrients.
- ADCs data clearly indicate that RPC has a lower digestibility than FM.
- Lower digestibility of RPC may have brought about regressed digestible protein to growth as the RPC substitution increases above 50%.
- The higher inclusion of less costly plant proteins (RPC) will bring about less inclusion of costly FM in the feed formulations.

The effect of dietary pigments on the coloration of Japanese ornamental carp (koi, *Cyprinus carpio L.*)
Xiangjun Sun, Yu Chang, Yuantu Ye, Zhihong Ma, Yongjun Liang, Tieliang Li, Na Jiang, Wei Xing, Lin Luo

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**Highlights**
- Evaluating the effect of dietary pigment on the coloration of koi (*Cyprinus carpio L.*).
- Carophyll® red and *Spirulina platensis* can improve Showa koi pigmentation effectively.
- Body coloration responded with applied dietary carotenoid and xanophylls dose.
- Carotenoid had deeper and further influence on koi body coloration than xanophylls.

Effects of dietary iron supplementation on growth performance, fatty acid composition and fatty acid metabolism in rainbow trout (*Oncorhynchus mykiss*) fed vegetable oil based diets
Shyamalie D. Senadheera, Giovanni M. Turchini, Thanongsak Thanuthong, David S. Francis

**Highlights**
- Iron plays an important role in the active centres of fatty acid desaturase enzymes.
- Is dietary iron affecting LC-PUFA biosynthesis in fish fed fish oil free diets?
- Dietary iron level affected the final n-3 LC-PUFA content of fish tissues.
- Preliminary evidence that iron modulates the activity of desaturases was reported.
- This increased activity was insufficient to compensate for diets lacking in LC-PUFA.

**Physiology and Endocrinology**

**Changes of total carotenoid and lipid content in scallop tissues of Chlamys nobilis (Bivalve: Pectinidae) during gonad maturation**
Huaiping Zheng, Helu Liu, Wenhua Liu, Zewei Sun, Qian Zhang

**Highlights**
- Both total carotenoids and lipids content (TCC and TLC) were tissue-specific.
- They changed and were accumulated significantly in gonad during maturation.
- Both carotenoids and lipids were transferred from other tissues to gonad.
- A significantly positive correlation between TCC and TLC only existed in gonad.

**Production Science**

**Evaluation of egg quality parameters as predictors of hatching success and early larval survival in hapuku (Polyprion oxygeneios)**
Yair Y. Kohn, Jane E. Symonds

**Highlights**
- Eggs and larvae of a new farmed species Polyprion oxygeneios were quality assessed.
- Data were presented from two consecutive spawning seasons.
- Blastomere morphology score of incubated eggs correlated with hatching percentage.
- Blastomere morphology was the most predictive parameter for egg and larval quality.
- Use of the scoring method will improve hatchery management efficiency.

**Effects of carbohydrate addition on Litopenaeus vannamei intensive culture in a zero-water exchange system**
Lei Gao, Hong-Wei Shan, Tian-Wen Zhang, Wei-Yang Bao, Shen Ma

**Highlights**
- Carbon addition is beneficial to intensive shrimp culture without water-exchange.
- Carbon addition prevents the accumulation of TAN and NO2-N.
- Carbon addition improves C/N ratios in the water rather in the sediment.
- Bioactivities of bacteria, especially nitrogen cycle bacteria are increased.
- Carbon addition increases zooplankton density and shrimp growth performance.

**Influence of stocking density on growth of mussels (Mytilus galloprovincialis) in suspended culture**
Alhambra M. Cubillo, Laura G. Peteiro, María José Fernández-Reiriz, Uxío Labarta
Mussel growth was measured along a cultivation density gradient in suspended culture. A negative effect of high culture density on individual growth rates was observed. Mussels grown at lower densities reached greater asymptotic weight and length values. Differences in growth related to culture density suggest intraspecific competition. An increased effect of intraspecific competition with mussel size was observed.

Substitution of fishmeal with microbial floc meal and soy protein concentrate in diets for the pacific white shrimp *Litopenaeus vannamei*

Soy protein concentrate and microbial floc meal can serve as fishmeal substitute. Diet devoid of fishmeal produced similar performance than the commercial diets. Growth of *L. vannamei* is not affected by fishmeal substitution. Survival exceeded 90% for all treatments.

Acute toxicity and histopathology of channel catfish fry exposed to peracetic acid
David L. Straus, Thomas Meinelt, Bradley D. Farmer, Benjamin H. Beck

Peracetic acid (PAA) is effective to prevent fungus on catfish eggs; how much PAA is toxic to hatching catfish fry was unknown. We found it was more toxic to swim-up fry (~ 7 day old) than to yolk-sac fry (~ 1 day old). The safe treatment rate was 1.7 ppm for yolk-sac fry and 1.3 ppm for swim-up fry.

Short Communications

Screening for toxigenic marine-derived fungi in Algerian mussels and their immediate environment
Amaria Matallah-Boutiba, Nicolas Ruiz, Claire Sallenave-Namont, Olivier Grovel, Jean-Claude Amiard, Yves François Pouchus, Zitouni Boutiba

250 fungal strains were isolated from mussels and their immediate environment (marine sediments and seawater) from Algerian coast. Main genera were *Penicillium* (55.1%), *Aspergillus* (8.3%), *Trichoderma* (5.8%), and *Cladosporium* (3.7%). Fungal extracts were tested on *Artemia salina* larvae. 24% of fungal extracts exhibit a toxicity.

Setting an epidemiological cut-off value for the single plate protocol from disc diffusion data generated for *Aeromonas salmonicida*
Peter Smith

The susceptibility of *A. salmonicida* was measured using the single plate protocol. A single epidemiological cut-off value (ECV) could be applied to data for 5 agents.
categorisation of strains showed 100% agreement with standard approaches. The possibility that the application of the ECV is universally valid is discussed.
Aquacultural Engineering

VOLUME 48, ISSUE 1, MAY 2012

Research articles

Effluent volume and pollutant loads at an inland, low-salinity, shrimp farm in Alabama
Naparat Prapaiwong, Claude E. Boyd

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Highlights
► An inland shrimp farm discharged about 50% of pond water during harvest. ► Water discharged had elevated concentration of several potential pollutants, especially dissolved salt. ► Nitrogen and phosphorus discharge was 1.33 kg phosphorus and 15.2 kg nitrogen per tonne shrimp.

Numerical investigation of the hydrodynamic behaviors of multiple net cages in waves
Tiao-Jian Xu, Guo-Hai Dong, Yun-Peng Zhao, Yu-Cheng Li, Fu-Kun Gui

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Highlights
► An effective numerical model is developed to study the hydrodynamic behavior of multiple net cages in waves. ► A comparison between two cage arrangements is performed to offer data for the design of mooring cage design. ► The effect of wave directions on hydrodynamic behavior of multiple cages is analyzed, and the damage of a prototype mooring cage system is simulated.

Modeling inflow rates for the water exchange management in semi-intensive aquaculture ponds
Juan Carlos Gutiérrez-Estrada, Inmaculada Pulido-Calvo, Ignacio de la Rosa, Bruno Marchini

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Highlights
► We model the inflow rates to semi-intensive aquaculture ponds. ► We evaluated two classical and two heuristic modeling techniques. ► Heuristic models provided the best fits using turbidity and dissolved oxygen as input variables. ► These models proved to be useful tools for the development of policies on water exchange management.

Water delivery capacity of a vacuum airlift – Application to water recycling in aquaculture systems
Bertrand Barrut, Jean-Paul Blancheton, Jean-Yves Champagne, Alain Grasmick

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Highlights
► Water flow rates delivered by a vacuum airlift were measured for different air flows, pipe lengths, depression levels, lift heights and salinities. ► The vacuum airlift was tested in rearing condition and showed differences in pumping efficiency before and after feeding. ► An empirical model was developed and showed high correlation to experimental data. ► Efficiencies and energy costs of the vacuum airlift were calculated and compared to other pumps.
Effects of two temperatures on the oxygen consumption rates of *Seriolella violacea* (palm fish) juveniles under rearing conditions
C. Nerici, G. Merino, A. Silva

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**Highlights**
- Oxygen consumption rates were determined for *Seriolella violacea* under farm-like conditions.
- Maximum oxygen consumption rates were 1.69 and 2.42 mg O₂/kg fish/min for 14 and 18 °C, respectively.
- Oxygen consumption rates are a valuable insight for *S. violacea* under farm conditions.

Evaluation of a trawl to estimate the inventory of catfish in commercial ponds
Pratheesh O. Sudhakaran, David Heikes, Carole Engle, Steeve Pomerleau

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**Highlights**
- Trawl evaluated for potential to estimate catfish inventory.
- Trawl appears to have potential to estimate mean sizes and frequency distribution of sizes of catfish.
- Additional work needed before trawl could be used to estimate pond biomass inventory.

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**Research articles**

**Evaluation of lipid-enriched Artemia on the reproductive performance of the white-striped cleaner shrimp, Lysmata amboinensis**
V. Tziouveli, M. Hall and G. G. Smith
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**Microarray analysis of differential utilization of plant-based diets by rainbow trout**
Ken Overturf, Roger L. Vallejo, Yniv Palti, Fredrick T. Barrows and James E. Parsons
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**Impact evaluation of SGSY on socio-economic development of women in aquaculture in Eastern Hills of Orissa**
Nirupama Panda, A. S. Mahapatra and Rasmiprava Samal
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**Effects of exogenous dietary enzyme on growth, body composition, and fatty acid profiles of cultured great sturgeon Huso huso fingerlings**
Mohammad Reza Ghomi, Ramezan Shahriari, Hamid Faghani Langroudi, Mehdi Nikoo and Eric von Elert
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**Effects of dietary vegetable oils on liver and gonad fatty acid metabolism and gonad maturation in gilthead seabream (Sparus aurata) males and females**
Elham A. Wassef, Olfat M. Wahbi and Shaymaa H. Shalaby
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**Effects of different dietary wheat starch levels on growth, feed efficiency and digestibility in grass carp (Ctenopharyngodon idella)**
Li Xia Tian, Yong Jian Liu, Hui Jun Yang, Gui Ying Liang and Jin Niu
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**Assessing the feasibility of sponge aquaculture as a sustainable industry in The Bahamas**
Annabelle Oronti, Andy J. Danylchuk, Christina E. Elmore, Rocco Auriemma and Giusto Pesle
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**Growth and gonad development of the tropical black-lip pearl oyster, Pinctada margaritifera (L.), in the Gambier archipelago (French Polynesia)**
Gilles Le Moullac, Jérôme Tiapari, Hinan Teissier, Elodie Martinez and Jean-Claude Cochard
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**Interactive effects of dietary protein and live bakery yeast, Saccharomyces cerevisiae on growth performance of Nile tilapia, Oreochromis niloticus (L.) fry and their challenge against Aeromonas hydrophila infection**
Mohsen Abdel-Tawwab
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Bioeconomic effect from the size selection in red abalone intensive culture *Haliotis rufescens* as a production strategy
Eduardo P. Pérez, Andrea Araya, Marcelo Araneda and Claudio Zúñiga
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Effects of elevated ambient histamine level on survival, growth, sexual maturity and tissue histamine accumulation of the mysis *Neomysis awatschensis* and *Neomysis japonica Nakazawa*
Xiaozhen Yang, Jinfeng Wang, Liulan Zhao, Peng Fan and Xugan Wu, et al.
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Use of soy protein concentrate in practical diets for Pacific white shrimp (*Litopenaeus vannamei*) reared under field conditions
Daranee Sookying and D. Allen Davis
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Acute toxicity of ammonia on juvenile cobia (*Rachycentron canadum*, Linnaeus, 1766) according to the salinity
Edison Barbieri and Sonia Assami Doi
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Dietary protein requirement for fingerling *Channa punctatus* (Bloch), based on growth, feed conversion, protein retention and biochemical composition
Seemab Zehra and Mukhtar A. Khan
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Malcolm Jobling Download PDF (108.7 KB) View HTML

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AquacultureNutrition

VOLUME 18, PART 2, APRIL 2012

Research articles

Use of chitin and krill in aquaculture – the effect on gut microbiota and the immune system: a review (pages 117–131)
E. Ringø, Z. Zhou, R.E. Olsen and S.K. Song
Abstract Full Article (HTML) PDF(823K) References

Reviews article

Reviews article

Original articles

Replacement of fish meal in juvenile channel catfish, Ictalurus punctatus, diets using a yeast-derived protein source: the effects on weight gain, food conversion ratio, body composition and survival of catfish challenged with Edwardsiella ictaluri (pages 132–137)
B.C. PETERSON, N.J. BOOTH and B.B. MANNING
Abstract Full Article (HTML) PDF(795K) References

Maslinic acid and ration size enhanced hepatic protein-turnover rates of gilthead sea bream (Sparus aurata) (pages 138–151)
Abstract Full Article (HTML) PDF(1398K) References

Effects of feeding stimulants on the feed consumption, growth and survival at glass eel and elver stages in the European eel (Anguilla anguilla) (pages 152–166)
J.A. HIRT-CHABBERT, A. SKALLI, O.A. YOUNG and E. GISBERT
Abstract Full Article (HTML) PDF(1186K) References

Dietary supplementation with the microalgae Parietochloris incisa increases survival and stress resistance in guppy (Poecilia reticulata) fry (pages 167–180)
P.R. NATH, I. KHOZIN-GOLDBERG, Z. COHEN, S. BOUSSIBA and D. ZILBERG
Abstract Full Article (HTML) PDF(1077K) References

Dietary available phosphorus requirement of juvenile grass carp (Ctenopharyngodon idella) (pages 181–188)
J.-J. LIANG, Y.-J. LIU, L.-X. TIAN, H.-J. YANG and G.-Y. LIANG
Abstract Full Article (HTML) PDF(824K) References

Comparative effects of dietary l-carnitine supplementation on diploid and triploid rainbow trout (Oncorhynchus mykiss) (pages 189–201)
R.O.A. OZÓRIO, C. ESCORCIO, R.J.B. BESSA, B. RAMOS and J.F.M. GONÇALVES
Abstract Full Article (HTML) PDF(902K) References

Aqueous fractionation improves the nutritional value of wheat distillers grains for rainbow trout (Oncorhynchus mykiss) (pages 202–210)
F.E. REVECO, S.A. COLLINS, K.M. RANDALL and M.D. DREW
Abstract Full Article (HTML) PDF(751K) References
Effects of diludine supplementation on growth performance, liver antioxidant enzyme activities and muscular trace elements of rainbow trout (Oncorhynchus mykiss) juveniles at a low water temperature (pages 211–219)
O. HISAR, T. YANIK, E.M. KOCAMAN, M. ARSLAN, A. SLUKVIN and R. GONCHAROVA
Abstract Full Article (HTML) PDF(893K) References

Effects of dietary histidine levels on growth performance, body composition and intestinal enzymes activities of juvenile Jian carp (Cyprinus carpio var. Jian) (pages 220–232)
Abstract Full Article (HTML) PDF(1023K) References

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Current Opinion in Microbiology

VOLUME 15, PART 2, APRIL 2012

Research articles
Cell regulation
Edited by Vanessa Sperandio and Nancy Freitag

Cell regulation
Vanessa Sperandio, Nancy Freitag

Histidine kinases and response regulators in networks
Kirsten Jung, Luitpold Fried, Stefan Behr, Ralf Heermann

Highlights
► Histidine kinase/response regulator systems are important signaling devices. ► Various accessory proteins are involved in co-sensing and signal integration. ► Scaffold proteins assemble histidine kinase/response regulator pathways. ► Histidine kinases and response regulators are embedded in networks.

Regulation of prokaryotic gene expression by eukaryotic-like enzymes
Kellie Burnside, Lakshmi Rajagopal

Highlights
► Serine/threonine kinases and phosphatases regulate prokaryotic gene expression. ► Signaling mediates growth, virulence and antibiotic resistance. ► Targets include DNA-binding regulators, transcriptional and translational machinery.

Rewiring two-component signal transduction with small RNAs
Yvonne Göpel, Boris Görke

Highlights
► Many two-component systems (TCSs) control gene expression through sRNAs. ► Antisense RNAs represent a novel class of gene regulators employed by TCSs. ► Conversely, synthesis of a TCS may be controlled by sRNAs. ► Several TCSs employ multiple homologous sRNAs increasing complexity of regulation. ► sRNAs have unique features in gene regulation explaining their integration in TCS networks.

You've come a long way: c-di-GMP signaling
Holger Sondermann, Nicholas J Shikuma, Fitnat H Yildiz

Highlights
► Nucleotide-based second messengers, such as cyclic dimeric guanosine monophosphate (c-di-GMP), play important roles in the physiology of many bacteria. ► The basic biochemistry of c-di-GMP turnover and c-di-GMP-dependent phenotypes are known. ► Studies on the regulation of c-di-GMP generation and dissolution, identities of c-di-GMP receptors and their targets are contributing to the general understanding of how c-di-GMP signaling operates.

The bacterial chemical repertoire mediates metabolic exchange within gut microbiomes
Christopher M Rath, Pieter C Dorrestein
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Highlights
► Gut microbiome derived metabolic exchange factors have been shown to mediate biology in the gut. ► Evidence exists for the biosynthetic capability of the gut microbiome to generate active molecules. ► Key described biology may be the result of diffusible molecules produced by the gut microbiota. ► Advances in analytical technologies will develop our understanding of microbiome chemistry.

Rules of engagement: defining bacterial communication
Apollo R Stacy, Stephen P Diggle, Marvin Whiteley
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Highlights
► ‘Communication’ has been used to describe many bacterial chemical interactions. ► Insights can be gained from evolutionary classifications of chemical interactions. ► Researchers should define the terms ‘signal’ and ‘communication.’

Exploitation of host signaling pathways by microbial quorum sensing signals
Kendra P Rumbaugh, Gunnar F Kaufmann
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Highlights
► Review on microbial/mammal interkingdom signaling. ► Highlights new developments on how microbial quorum sensing signals affect host–cell signaling pathways. ► Summarizes key historic findings.

Metalloregulation of Gram-positive pathogen physiology
Catherine A Wakeman, Eric P Skaar
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Highlights
► Pathogenic organisms encounter metal stresses in the host environment. ► Pathogens alter their physiology to accommodate iron restriction within the host. ► Copper excess within the host induces multiple forms of toxicity in bacteria.

Silencing of foreign DNA in bacteria
Sabrina S Ali, Bin Xia, Jun Liu, William Wiley Navarre
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Highlights
► Many bacteria contain xenogeneic silencing proteins that silence AT-rich DNA. ► There are three structurally distinct families of xenogeneic silencers. ► Lsr2 of Mycobacteria and H-NS of enterobacteria bind DNA by a similar mechanism. ► Xenogeneic silencers form higher order structures on DNA through cooperative interactions. ► Two modes of binding by H-NS have been proposed, bridging and stiffening.

Extra cytoplasmic function σ factor activation
Theresa D Ho, Craig D Ellermeier
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Highlights
► Here we discuss the common features of ECF sigma factors. ► We discuss the mechanisms controlling σE from Escherichia coli. ► We compare what is known about activation of σW in Bacillus subtilis to σE from Escherichia coli.
Making a beta-barrel: assembly of outer membrane proteins in Gram-negative bacteria
Nathan W Rigel, Thomas J Silhavy
► Outer membrane protein (OMP) assembly requires the Bam complex. ► Several structures of the Bam complex members are now available. ► The OMP assembly reaction has been reconstituted in vitro using purified Bam proteins and requires chaperone for full activity.

Recent advances in pneumococcal peptidoglycan biosynthesis suggest new vaccine and antimicrobial targets
Lok-To Sham, Ho-Ching T Tsui, Adrian D Land, Skye M Barendt, Malcolm E Winkler

Coordinate regulation of Gram-positive cell surface components
Brett R Hanson, Melody N Neely
► Peptidoglycan, teichoic acids and capsule are a major part of the cell surface network. ► Cell surface components function cooperatively to provide stability and protection. ► Recent work highlights the importance of understanding surface component associations. ► Greater understanding of cell surface network will provide new antimicrobial targets.

The control of death and lysis in staphylococcal biofilms: a coordination of physiological signals
Marat R Sadykov, Kenneth W Bayles
► We discuss the roles of the Staphylococcus aureus cid and lrg operons in death and lysis during biofilm development. ► We describe the function of the S. aureus LytSR and CidR regulatory proteins in the control of cid and lrg expression. ► We hypothesize that the metabolic heterogeneity observed within the biofilm environment determines the differential expression of cid and lrg, which in turn, dictates which cells die and lyse.
No new issue available
Characterization and biological function analysis of the trim3a gene from zebrafish (Danio rerio)
Xinshang Zhang, Heng Zhao, Yeyu Chen, Chao Liu, Kun Meng, Peilong Yang, Yaru Wang, Guozeng Wang, Bin Yao
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Highlights
► The mRNA expression level of TRIM3a has been found the highest in brain, with a little in spleen, liver, and gill. ► The expression level of trim3a began to rise dramatically during the pharyngula period, and could be detected in brain by in situ hybridization. ► TRIM3a underwent self-polyubiquitylation, and was dependent on its RING domain, suggesting that TRIM3a protein might function as a RING finger E3 ubiquitin ligase.

Effects of graded levels of dietary methionine hydroxy analogue on immune response and antioxidant status of immune organs in juvenile Jian carp (Cyprinus carpio var. Jian)
Sheng-Yao Kuang, Wei-Wei Xiao, Lin Feng, Yang Liu, Jun Jiang, Wei-Dan Jiang, Kai Hu, Shuhong Li, Ling Tang, Xiao-Qiu Zhou
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Highlights
► MHA can increase fish growth through improving diseases resistance. ► MHA can improve fish immune response, thus enhance diseases resistance. ► MHA enhances immune response partly by promoting antioxidant status in immune organs.

Slow release cortisol implants result in impaired innate immune responses and higher infection prevalence following experimental challenge with infectious pancreatic necrosis virus in Atlantic salmon (Salmo salar) parr
K. Gadan, I. Singh Marjara, H. Sundh, K. Sundell, Ø. Evensen
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Highlights
► Cortisol implants in Atlantic salmon gave chronic increase of plasma cortisol. ► Expression of IFNα, Mx, HSP70, SAA, GR and HSP90 tends down-regulated by cortisol. ► IPNV infection prevalence was higher in cortisol-implanted fish compared controls. ► Innate immune responses were impaired with higher virus prevalence.

Effects of white spot syndrome virus infection on immuno-enzyme activities and ultrastructure in gills of Cherax quadricarinatus
Dan-Li Wang, Di Zuo, Lan-Mei Wang, Ting Sun, Qun Wang, Yun-Long Zhao
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Highlights
► WSSV infection regulated immune-related enzymes in the gills of *Cherax quadricarinatus*.
► Immunization with polysaccharides enhanced WSSV-induced immune enzyme activities.
► WSSV infection damaged ultrastructure of gill epithelial cells and blood cells.

**Effects of emodin and vitamin C on growth performance, biochemical parameters and two HSP70s mRNA expression of Wuchang bream (*Megalobrama amblycephala Yih*) under high temperature stress**
Jianhua Ming, Jun Xie, Pao Xu, Xianping Ge, Wenbin Liu, Jinyun Ye

**Highlights**
► Fish fed with 60 mg/kg emodin, 700 mg/kg vitamin C, and their combination for 60 days.
► Then 25 fish per tank were exposed to heat stress of 34 °C. ► Either emodin or high-dose vitamin C could promote the growth of fish, lower FCR. ► Increasing non-specific immunity of fish, antioxidant capacity and resistance to heat stress. ► The combination of emodin and high-dose Vc did not result in better effect.

**Modulation of warm-temperature-acclimatation-associated 65-kDa protein genes (Wap65-1 and Wap65-2) in mud loach (*Misgurnus mizolepis, Cypriniformes*) liver in response to different stimulatory treatments**
Young Sun Cho, Bong Seok Kim, Dong Soo Kim, Yoon Kwon Nam

**Highlights**
► We isolated and characterized cDNAs encoding mud loach Wap65-1 and Wap65-2 isoforms. ► Wap65-2 is more homologous to human hemopexin than is Wap65-1. ► Wap65 isoforms are predominantly expressed in liver and developmentally regulated. ► Wap65-1 is more responsive to warm temperature than Wap65-2. ► Wap65-2 is much more stimulated by immune and metal challenges than Wap65-1.

**Molecular cloning, characterization and gene expression of an antioxidant enzyme catalase (MrCat) from *Macrobrachium rosenbergii***
Jesu Arockiaraj, Sarasvathi Easwvaran, Puganeshwaran Vanaraja, Arun Singh, Rofina Yasmin Othman, Subha Bhassu

**Highlights**
► MrCat from *Macrobrachium rosenbergii* has been characterized at molecular level. ► Gene expression was stimulated with IHHNV and is up-regulated in digestive tract. ► Recombinant MrCat protein was purified and studied their functional activities. ► MrCat protein existed in high thermal stability and broad spectrum of pH.

**Identification and characterization of two novel types of non-clip domain serine proteases (PtSP and PtSPH1) from cDNA haemocytes library of swimming crab *Portunus trituberculatus***
Qianqian Li, Zhaoxia Cui, Yuan Liu, Shuangyan Wang, Chengwen Song

**Highlights**
► One serine protease and one serine protease homolog without clip domain were identified. ► Phylogenetic analysis suggested they might not have a single origin in gene
evolution. ► Six introns presented in PtSP genomic DNA while four introns in PtSPH1 genomic DNA. ► PtSP was mainly in haemocytes, gill and eyestalk, whereas PtSPH1 was in stomach. ► PtSPH1 might be more sensitive to microorganism challenges compared with PtSP.

Identification, cloning and expression analysis of Catechol-O-methyltransferase (COMT) gene from shrimp, *Penaeus monodon* and its relevance to salinity stress
S. Rajesh, J. Kiruthika, A.G. Ponniah, M.S. Shekhar

**Highlights**
► Catechol-O-methyltransferase (COMT) was identified in salinity stressed shrimp. ► The full length cDNA (666 bp) of COMT was cloned from the gills of *Penaeus monodon*. ► Low salinity conditions (3ppt) revealed increased expression of COMT transcripts.

Immune gene mining by pyrosequencing in the rockshell, *Thais clavigera*
Jae-Sung Rhee, Bo-Mi Kim, Chang-Bum Jeong, Toshihiro Horiguchi, Young-Mi Lee, Il-Chan Kim, Jae-Seong Lee

**Highlights**

Transglutaminase regulates immune-related genes in shrimp
Fernand F. Fagutao, Mary Beth B. Maningas, Hidehiro Kondo, Takashi Aoki, Ikuo Hirono

**Highlights**
► The transcriptomic profile of shrimp after TGase silencing was examined. ► Silencing of TGase down-regulated the expressions of crustin and lysozyme. ► Absence of TGase resulted in low haemocyte counts and high bacterial counts. ► Shrimp TGase is linked with the release of antimicrobial peptides.

A scallop C-type lectin from *Argopecten irradians* (AiCTL5) with activities of lipopolysaccharide binding and Gram-negative bacteria agglutination
Changkao Mu, Xiaoyan Song, Jianmin Zhao, Lingling Wang, Limei Qiu, Huan Zhang, Zhi Zhou, Mengqiang Wang, Linsheng Song, Chunlin Wang

**Highlights**
► A single-CRD C-type lectin (AiCTL5) from *Argopecten irradians*. ► The recombinant protein could agglutinate some of Gram-negative bacteria. ► It exhibited a significantly strong activity to bind LPS. AiCTL5 functions as a pattern recognition receptor in scallop innate immunity.

A new anti-lipopolysaccharide factor isoform (PtALF4) from the swimming crab *Portunus trituberculatus* exhibited structural and functional diversity of ALFs
Yuan Liu, Zhaxia Cui, Xihong Li, Chengwen Song, Qianqian Li, Shuangyan Wang
An anti-lipopolysaccharide factor isoform (PtALF4) from swimming crab was cloned. PtALF4 shared lower amino acid similarity with the reported ALFs. PtALF4 transcript was predominantly in eyestalk. The recombinant proteins revealed different antimicrobial activities.

**Influence of elevated temperatures on the immune response of abalone, *Haliotis rubra***

Vinh T. Dang, Peter Speck, Kirsten Benkendorff

Elevated water temperature can cause disparate immune responses in abalone. Haemocyte numbers increase rapidly in response to temperature stress. Whereas humoural immune parameters show a delayed response. Antiviral activity tends to increase with increasing temperature. Antibacterial activity becomes compromised after prolonged exposure to warm waters.

**Alternation of immune parameters and cellular energy allocation of *Chlamys farreri* under ammonia-N exposure and *Vibrio anguillarum* challenge**

Xingqiang Wang, Lingling Wang, Chen Yao, Limei Qiu, Huan Zhang, Zhou Zhi, Linsheng Song

Immune response and environmental stress imposes greater costs on scallop’s energy expenditure. CEA in the tissues decreased significantly under environmental stress. Stress-induced cellular damage and increased energy expenditure might result in mass mortalities scallops.

**Effects of potential probiotic *Bacillus subtilis* T13 on growth, immunity and disease resistance against *Vibrio splendidus* infection in juvenile sea cucumber *Apostichopus japonicus***

Yancui Zhao, Wenbing Zhang, Wei Xu, Kangsen Mai, Yanjiao Zhang, Zhiguo Liufu

A probiotic *Bacillus subtilis* T13 was isolated from the healthy sea cucumber. It improved the growth, immune responses and disease resistance of sea cucumber. The beneficial dosage of dietary *B. subtilis* T13 is 10⁹ CFU/g diet.

**Effectiveness of bivalent vaccines against *Aeromonas hydrophila* and *Lactococcus garvieae* infections in rainbow trout *Oncorhynchus mykiss* (Walbaum)**

Asmine Bastardo, Carmen Ravelo, Nuria Castro, José Calheiros, Jesús L. Romalde

We evaluate the efficacy of two bivalent vaccines against *Lactococcus garvieae* and *Aeromonas hydrophila*. Bivalent vaccines *L. garvieae* + *A. hydrophila* confer efficient protection on fish. Vaccinated fish showed specific antibody responses against inactivated...
bacteria. ► Adjuvanted bivalent vaccine confers longer protection than aqueous bivalent vaccine.

**Arginine and glutamine supplementation to culture media improves the performance of various channel catfish immune cells**
Camilo Pohlenz, Alejandro Buentello, Waitaha Mwangi, Delbert M. Gatlin III

- In vitro amino acid utilization by channel catfish leucocytes was analyzed.
- Leucocyte performance was evaluated on arginine and/or glutamine supplemented media.
- Activated macrophages and lymphocytes significantly use arginine and glutamine.
- Arginine enhances phagocytosis and bactericidal capacity by macrophages.
- Arginine and glutamine enhances proliferative responses of B and T lymphocytes.

**Dexamethasone modulates expression of genes involved in the innate immune system, growth and stress and increases susceptibility to bacterial disease in Senegalese sole (Solea senegalensis Kaup, 1858)**
E. Salas-Leiton, O. Coste, E. Asensio, C. Infante, J.P. Cañavate, M. Manchado

- Dexamethasone (DXM) affects negatively growth and resistance to bacteria.
- pomcβ and crfbp are the main genes of HPI axis regulating cortisol levels.
- DXM down-regulates lysg and igf-I gene expression.
- hamp1 and hsp70 exhibit a dual-mode gene expression pattern following DXM treatments.
- gr1, gr2, pomca, trh, tgb, hsp90aa, igf-Ir did not modify gene expression.

**Identification and expression analysis of three c-type lysozymes in Oreochromis aureus**
Feng-ying Gao, Lan Qu, Shao-guo Yu, Xing Ye, Yuan-yuan Tian, Li-li Zhang, Jun-jie Bai, Maixin Lu

- Three chicken-type lysozyme cDNAs were isolated from tilapia Oreochromis aureus.
- These three c-type lysozyme mRNAs were expressed in all the tissues examined.
- Expressions of these lysozymes were up-regulated after challenged with bacteria.
- Three recombinant lysozymes showed lytic activities against several bacteria species.

**Molecular cloning, characterization and expression of the complement component Bf/C2 gene in grass carp**
Yubang Shen, Junbin Zhang, Xiaoyan Xu, Jianjun Fu, Feng Liu, Jiale Li

- Two complement Bf/C2 were characterized from grass carp, gcBf/C2A and gcBf/C2B.
- Two Bf/C2 genes transcription are constitutively expressed.
- Two Bf/C2 genes expression can be induced significantly by A. hydrophila challenge.
- Two Bf/C2 genes play an important role in embryonic development stages in grass carp.

**Transcriptomic analysis of the host response to early stage salmonid alphavirus (SAV-1) infection in Atlantic salmon Salmo salar L.**
Tharangani K. Herath, James E. Bron, Kim D. Thompson, John B. Taggart, Alexandra Adams, Jacqueline H. Ireland, Randolph H. Richards

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**Highlights**

► Salmon pancreas disease, caused by salmonid alphavirus (SAV).
► Host transcriptomic response of early stages infection was evaluated by microarray.
► Immune mechanisms associated genes were significantly differentially expressed.
► It includes Interferon I and Major Histocompatibility Complex pathways.
► Genes of apoptosis and cellular stress were differentially expressed too.

Molecular characterization, expression, and functional analysis of two thioredoxins in the black rockfish (*Sebastes schlegelii*)
Chan-Il Park, Jee-Hyun Jung, Won Joon Shim, Ju-Won Kim, Eun-Gyeong Kim, Ji-Min Jeong, Do-Hyung Kim

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**Highlights**

► Two TRx homologue cDNAs were identified from a black rockfish.
► TRx1-1 and TRx1-2 had an active motif of WCPPC and WCGPC, respectively.
► TRx1-1 and -2 were highly expressed in liver and gill and PBLs and gill, respectively.
► The two recombinant proteins induced increased leukocyte proliferation and viability.

RNA-seq analysis of mucosal immune responses reveals signatures of intestinal barrier disruption and pathogen entry following *Edwardsiella ictaluri* infection in channel catfish, *Ictalurus punctatus*
Chao Li, Yu Zhang, Ruijia Wang, Jianguo Lu, Samiran Nandi, Sriprakash Mohanty, Jeffery Terhune, Zhanjiang Liu, Eric Peatman

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**Highlights**

► Using Illumina RNA-seq, we surveyed channel catfish transcriptomic responses in the intestine following challenge with ESC.
► Approach captured a large number of catfish genes and quantified transcript levels of 1633 differentially expressed genes.
► Study revealed patterns of teleost mucosal gene expression indicative of pathogen manipulation of the intestinal epithelium.

Antiviral effects of β-defensin derived from orange-spotted grouper (*Epinephelus coioides*)
Minglan Guo, Jingguang Wei, Xiaohong Huang, Youhua Huang, Qiwei Qin

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**Highlights**

► EcDefensin was involved in immune responses to viral infection and pathogen challenges.
► EcDefensin showed antiviral activities against the infection of SGIV and VNNV in vivo.
► EcDefensin inhibited directly the infection and replication of viruses.
► EcDefensin inducted type I interferon-related immune response against viral infection.

Evaluation of immunostimulatory and growth promoting effect of seed fractions of *Achyranthes aspera* in common carp *Cyprinus carpio* and identification of active constituents
Rina Chakrabarti, Praveen Kumar Srivastava, Kanika Kundu, Rashmi Sahay Khare, Shanta Banerjee
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**Highlights**
► Achyranthes aspera seeds enhanced the survival and growth of common carp larvae. ► Seeds also showed immunostimulatory property. ► Ecdysterone, linolenic and oleic acids are active constituents of seeds.

**Stimulatory effects of chitinase on growth and immune defense of orange-spotted grouper (Epinephelus coioides)**
Yanhong Zhang, Shaozhen Feng, Jun Chen, Chaobin Qin, Haoran Lin, Wensheng Li

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**Highlights**
► Grouper chitinase1 was first expressed in Pichia pastoris. ► The recombinant chitinase1 had obvious effects on growth and immune defense. ► Chitinase1 and chitinase2 mRNA expression were significantly stimulated by LPS. ► LPS induced significant increase on chitinase1 protein secretion. ► The pathogen could be inhibited by the recombinant protein to a certain extent.

**First report of two thioredoxin homologues in crustaceans: Molecular characterization, genomic organization and expression pattern in swimming crab Portunus trituberculatus**
Chengwen Song, Zhaoxia Cui, Yuan Liu, Shuangyan Wang, Qianqian Li

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**Highlights**
► Two thioredoxin homologues were characterized from swimming crab. ► Sequence analysis revealed PtTrx1 and PtTrx2 were encoded by different genomic locus. ► First PtTrxs genomic structure analysis in crustaceans was revealed. ► PtTrx1 mRNA was mainly detected in gill, while, PtTrx2 in eyestalk and gill. ► PtTrxs mRNA showed different expression profile after three microorganisms challenge.

**Acute and sublethal effects in an Indian major carp Cirrhinus mrigala exposed to silver nitrate: Gill Na⁺/K⁺-ATPase, plasma electrolytes and biochemical alterations**
Varadharaj Sathya, Mathan Ramesh, Rama Krishna Poopal, Bheeman Dinesh

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Graphical abstract

**Highlights**
Silver is potentially a toxic heavy metal to freshwater fish. Free ionic Ag block the Na+/K+-ATPase and leads to ionoregulatory failure and death. The toxicity of silver depends on water quality parameters and fish species. We suggested a few sensitive biomarkers to assess the toxicity of silver in carp. This study will help to establishment of water quality criteria.

Cloning and expression analysis of interferon regulatory factor (IRF) 3 and 7 in large yellow croaker, *Larimichthys crocea*
Cui-Luan Yao, Xue-Na Huang, Zejun Fan, Peng Kong, Zhi-Yong Wang

A novel hepcidin-like in turbot (*Scophthalmus maximus* L.) highly expressed after pathogen challenge but not after iron overload
P. Pereiro, A. Figueras, B. Novoa

Development of a quantitative assay to measure expression of transforming growth factor β (TGF-β) in Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) and evaluation of potential pitfalls in use with field-collected samples
Laura S. Robertson, Christopher A. Ottinger, Summer M. Burdick, Scott P. VanderKooi

Molecular cloning and characterization of nucleotide binding and oligomerization domain-1 (NOD1) receptor in the Indian Major Carp, rohu (*Labeo rohita*), and analysis of its inductive expression and down-stream signalling molecules following ligands exposure and Gram-negative bacterial infections
Banikalyan Swain, Madhubanti Basu, Mrinal Samanta
Dietary administration of chitooligosaccharides to enhance growth, innate immune response and disease resistance of *Trachinotus ovatus*
Shimei Lin, Shuhong Mao, Yong Guan, Xin Lin, Li Luo

**Highlights**
► COS supplementation significantly enhanced *Trachinotus ovatus* growth. ► COS could enhance the immune responses of *Trachinotus ovatus* and improve its resistance to infection by *Vibrio harveyi*. ► The diet with supplementation of 4.0 g kg\(^{-1}\) COS could maintain the growth and the immunity of fish at a higher level.

**Short Communications**

**Identification and expression analysis of goose-type lysozyme in half-smooth tongue sole (*Cynoglossus semilaevis*)**
Zhen-Xia Sha, Qi-Long Wang, Yang Liu, Song-Lin Chen

**Highlights**
► Full-length cDNA of *Cynoglossus semilaevis* g-type lysozyme (CsGLys) is 1191 bp and genomic DNA is 2535 bp. ► Deduced protein of CsGLys possesses the conserved GEWL domain and three catalytic residues E, D, D essential for anti-bacteria activity. ► Gene structure contains 5 exons and 4 introns similar to other teleosts. ► 5' flank region of CsGLys possesses several potential immune-related transcriptional factor binding sites. ► CsGLys expressed ubiquitously and up-regulated significantly in immune tissues at 12 h post bacteria infection.

**A teleostean angiotensinogen from *Oplegnathus fasciatus* responses to immune and injury challenges**
Navaneethaiyer Umasuthan, Ilson Whang, Kasthuri Saranya Revathy, Myung-Joo Oh, Sung-Ju Jung, Cheol Young Choi, Jeong-Ho Lee, Jae Koo Noh, Jehee Lee

**Highlights**
First report on interferon related developmental regulator-1 from Macrobrachium rosenbergii: Bioinformatic analysis and gene expression
Jesu Arockiaraj, Sarasvathi Easwvaran, Puganes hwaran Vanaraja, Arun Singh, Rofina Yasmin Othman, Subha Bhassu

 highlights
► MrIRDR-1 has been characterized bioinformatically. ► MrIRDR-1 contains a long IRDR super family domain. ► MrIRDR-1 is expressed in all the tissues and the highest at hepatopancreas. ► The expression is strongly upregulated after IHHNV infection. ► The result indicates the role of MrIRDR-1 in prawn defense system.

Molecular characterization of Cynoglossus semilaevis CD28
Yong-hua Hu, Bo-guang Sun, Tian Deng, Li Sun

 highlights
► The cDNA and gene of a CD28 homologue (CsCD28) was cloned from tongue sole. ► The CsCD28 gene is composed of four exons and three introns. ► Constitutive expression of CsCD28 was detected primarily in immune relevant tissues. ► CsCD28 is localized on the surface of head kidney lymphocytes. ► Ligation of CsCD28 promotes lymphocyte proliferation.

Short Sequence Report

Molecular characterization of a tandem-repeat galectin-9 (RuGlec9) from Korean rose bitterling (Rhodeus uyekii)
Hee Jeong Kong, Woo-Jin Kim, Hyung Soo Kim, Ye Ji Lee, Chi Hong Kim, Bo-Hye Nam, Young-Ok Kim, Dong-Gyun Kim, Sang-Jun Lee, Sang-Gu Lim, Bong-Seok Kim

 highlights
► We isolated the tandem-repeat galectin-9 (RuGlec9) cDNA from the Korean rose bitterling. ► RuGlec9 cDNA encodes a polypeptide of 323 amino acids containing two CRDs. ► RuGlec9 transcription was ubiquitously and increased by LPS in the spleen. ► RuGlec9 plays a role in innate immunity in Korean rose bitterling.

Erratum

Shengkang Li, Zhao Zhang, Chuanbiao Li, Lizhen Zhou, Wenhua Liu, Yuanyou Li, Yueling Zhang, Huaping Zheng, Xiaobo Wen

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Guest Editors: Katya E. Kovalenko and Sidinei M. Thomaz

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Respiratory response of the intertidal seastar Parvulastra exigua to contemporary and near-future pulses of warming and hypercapnia
D.J. McElroy, H.D. Nguyen, M. Byrne
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Highlights
► Temperature and pH flux in intertidal pools of Parvulastra exigua was characterised
► The metabolic response of P. exigua to warming and acidification was documented
► Warming increased metabolism, while acidification did not affect metabolism
► P. exigua metabolism is robust to contemporary warming and acidification
► Stressor interaction indicates vulnerability to future climate change

Relationship between energy allocation and reproductive strategy in Trisopterus luscus
Alexandre Alonso-Fernández, Fran Saborido-Rey
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Highlights
► Water content and energy are inversely related in tissues of Trisopterus luscus.
► Energy reserves in T. luscus females are mainly associated to lipids in liver.
► HSI has been detected as the best index to analyze nutritional status in pouting.
► Seasonality of energy reserves was clearly detected closely linked to sexual cycle.
► Fuel for reproduction comes essentially from stored energy.

Differentiated or not? An assessment of current knowledge of genetic structure of Sousa chinensis in China
Wenzhi Lin, Lihong Chang, Céline H. Frère, Ruilian Zhou, Jialin Chen, Xi Chen, Yuping Wu
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Highlights
► The genetic structure of Indo-Pacific humpback dolphin was investigated.
► No evidence for genetic structure or inter-population gene flow was found.
► Significant inbreeding was within expectation under random mating system.
► Lower genetic diversity of Sousa chinensis was shown.

Movement patterns of giant Pacific octopuses, Enteroctopus dofleini (Wülker, 1910)
D. Scheel, L. Bisson
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Graphical abstract
Highlights
► We tracked movements of giant Pacific octopus (Enteroctopus dofleini: Cephalopoda) in Alaska. ► Octopuses moved more than previously reported, with MCP areas over 40,000 and up to 130,000 m². ► Octopuses were hiding > 90% of the time, active nocturnally, and preferred kelp habitats. ► Movements may be risk-sensitive, use return-relocation rules and a habitat switching strategy.

Localization and antioxidant capacity of flavonoids in *Halophila johnsonii* in response to experimental light and salinity variation
Nathan M. Gavin, Michael J. Durako
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Highlights
► We examine physiological role of flavonoids in *H. johnsonii*. ► We examine antioxidant and flavonoid responses to light and salinity variations. ► Results suggest flavonoids may perform antioxidant functions. ► Hyposalinity combined with shading can reduce photosynthesis of *H. johnsonii*.

Resource partitioning by sympatric Steller sea lions and northern fur seals as revealed by biochemical dietary analyses and satellite telemetry
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Highlights
► We examine the diets of sympatric Steller sea lions and northern fur seals. ► Stable isotopes and fatty acids indicate significant dietary differences. ► Telemetry and stable isotopes indicate foraging grounds are spatially partitioned. ► Partitioning of forage resources may reduce inter-specific competition for prey. ► Differences may reflect adult provisioning strategies and pup fasting abilities.

Behavioral and morphological changes caused by thermal stress in the Great Barrier Reef sponge *Rhopaloeides odorabile*
Andrew J. Massaro, Jeremy B. Weiss, Malcolm S. Hill, Nicole S. Webster
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Highlights
► Temperatures below 31 °C have no effect on feeding behavior and morphology. ► At 31 °C, flow rate and choanocyte chamber density and size were reduced and filtration efficiencies were altered. ► Temperatures above 31 °C were lethal. ► *R. odorabile* is able to recover from short-term thermal stress.
Turbulence effects on the feeding dynamics in European sea bass (*Dicentrarchus labrax*) larvae
Mohamed-Sofiane Mahjoub, Ram Kumar, Sami Souissi, François G. Schmitt, Jiang-Shiou Hwang

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**Highlights**
- We studied turbulence and feeding duration effects on ingestion in sea bass larvae.
- We tested the condition of a high prey density as reported from a nursery area.
- Increasing turbulence resulted in decreasing ingestions.
- Turbulence affected the feeding to satiation level observed in calm water.

Effects of stress on sex change in *Crepidula cf. marginalis* (Gastropoda: Calyptraeidae)
Claire Mérot, Rachel Collin

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**Highlights**
- We examined effects of desiccation and food stress on sex change.
- Early starvation of *C. cf. marginalis* causes early smaller loss of male stage.
- Early starvation of *C. cf. marginalis* causes later larger gain of female stage.
- Desiccation treatment results in decreased size at sex change.
- Starved animals lose sex altogether but regain it rapidly when conditions improve.

An experimental approach to estimate egg production and development rate of the calanoid copepod *Eurytemora affinis* in Chesapeake Bay, USA
David Devreker, James J. Pierson, Sami Souissi, David G. Kimmel, Michael R. Roman

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**Highlights**
- Adult female senescence in *Eurytemora affinis* can affect egg production rate.
- *Eurytemora affinis* is more adapted to spring conditions than *Acartia tonsa*.
- *Eurytemora affinis* is less adapted to summer conditions than *Acartia tonsa*.
- *Eurytemora affinis* can drop its viable egg bag at high temperature.

Choosing among mobile prey species: Why do gulls prefer a rare subtidal crab over a highly abundant intertidal one?
Julie C. Ellis, Katherine E. Allen, Michelle S. Rome, Myra J. Shulman

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**Highlights**
- Gulls prefer *Cancer borealis* over two other available species of crab.
- We tested for differences in crypticity, behavior, profitability, and palatability.
- *Cancer borealis* is preferred because of its ease of capture and profitability.
- Gulls create a refuge for *Carcinus maenas* by reducing densities of *C. borealis*.

Within and between day variability in temperate reef fish assemblages: Learned response to baited video
Matthew J. Birt, Euan S. Harvey, Timothy J. Langlois

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Effect of temperature and food concentration on the relationship between growth and AARS activity in Paracartia grani nauplii
Inma Herrera, Lidia Yebra, Santiago Hernández-Léon

► Growth and protein synthesis rates of P. grani nauplii depended on temperature. ► Growth and protein synthesis rates of P. grani nauplii depended on food concentration. ► AARS activity is valid as index of somatic growth for P. grani nauplii. ► The relationship between spAARS activity and nauplii growth varied with food amount.

Lack of response in a marine pelagic community to short-term oil and contaminant exposure
Hege Vestheim, Katherine Langford, Ketil Hylland

► Oil, emamectin or a combination did not alter nutrients or community structure. ► Emamectin was predominantly found in the water phase, not associated with particles. ► There was an apparent hormetic effect of 0.005% acetone on some zooplankton.

Effects of predation on intraspecific aggregation of prey and prey diversity in a subtidal marine food web
Zachary T. Long, Mary I. O’Connor, John F. Bruno

► Intraspecific aggregation influences local and regional species diversity. ► We tested whether predators could influence prey aggregation in marine food webs. ► We found aggregation of marine invertebrate prey depended on predator composition. ► Increased aggregation increased both local and regional prey diversity. ► Behavioral responses of mobile prey to predators will influence marine food webs.

The invasive Asparagopsis armata versus the native Corallina elongata: Differences in associated peracarid assemblages
José M. Guerra-García, Macarena Ros, David Izquierdo, M. Mar Soler-Hurtado

Effect of broodstock origin, background and substrate color on skin coloration of three-spotted seahorses Hippocampus trimaculatus Leach, 1814
Geng Qin, Qiang Lin, Na Gu, Junda Lin, Liangmin Huang

► This is the first report of the instantaneous skin color change in seahorses. ► Skin coloration was negatively correlated with their body weights. ► Skin coloration was affected by broodstock origin, background and substrate color.

Refugia and top-down control of the pencil urchin Eucidaris galapagensis in the Galápagos Marine Reserve
Laura E. Dee, Jon D. Witman, Margarita Brandt
We tested factors that mediate predation on urchins across habitats in the Galápagos.
Refugia and anti-predator behaviors reduced predation on a Galápagos pencil urchin.
We hypothesize that urchin habitat-switching creates temporal refugia from predation.

Estimation of zooplankton secondary production in estuarine waters: Comparison between the enzymatic (chitobiase) method and mathematical models using crustaceans
Tatiana Ramos Avila, Anderson Abel de Souza Machado, Adalto Bianchini

Estuarine zooplankton biomass and production were estimated using different methods.
Net selectivity influences the estimation of zooplankton biomass and production.
Enzymatic method and mathematical models generate similar production data.
The enzymatic method is more practical than the mathematical models.

Observations on the settlement and cementation of barnacle (Balanus amphitrite) cyprid larvae after artificial exposure to noradrenaline and the locations of adrenergic-like receptors
Neeraj V. Gohad, Nick Aldred, Beatriz Orihuela, Anthony S. Clare, Dan Rittschof, Andrew S. Mount

Confocal imaging of Adrenergic-like receptors on cyprid sensory structures.
3D structure of the cyprid cement gland with Adrenergic-like receptors.
SEM description of noradrenaline induced cyprid-barnacle metamorphosis.

Ontogenetic variation in site fidelity and homing behaviour of a temperate reef fish
Jeffrey S. Shima, Daniel McNaughtan, Shane W. Geange, Shaun Wilkinson

We use translocations of tagged fish to study homing behaviour of three distinct age classes.
Adults of the common triplefin return to a home site when displaced up 200 m.
Recently settled individuals of the common triplefin do not move when displaced.
Juvenile stages of the common triplefin move little when displaced.
Results suggest site fidelity and homing behaviour vary with ontogeny.

Effect of temperature on embryonic development of Octopus mimus under controlled conditions

Results suggest site fidelity and homing behaviour vary with ontogeny.
Temperature and duration of embryonic phase are inversely related. A logarithmic model between development stages and age was validated. Similar degree-days (DD) were obtained of embryos incubated between 15 and 21 °C.
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**Characteristics of ovarian follicle steroidogenesis during vitellogenesis in an asynchronously ovulating stock of rainbow trout *Oncorhynchus mykiss* (pages 741–751)**
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The effect of adrenaline on the temperature dependency of cardiac action potentials in pink salmon *Oncorhynchus gorbuscha* (pages 876–885)
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A Rekecki, R A Y S A Gunasekara, K Dierckens, S Laureau, N Boon, H Favoreel, M Cornelissen, P Sorgeloos, R Ducatelle, P Bossier and W Van den Broeck
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Molecular evidence of anguillid herpesvirus-1 (AngHV-1) in the farmed Japanese eel, *Anguilla japonica* Temminck & Schlegel, in Korea (pages 315–319)
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**Research articles**

**Identification of animal Pasteurellaceae by MALDI-TOF mass spectrometry**  
Peter Kuhnert, Magne Bisgaard, Bożena M. Korczak, Sybille Schwendener, Henrik Christensen, Joachim Frey

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**Highlights**

► We established reference spectra for MALDI-TOF MS of Pasteurellaceae.  
► Named and unnamed taxa of Pasteurellaceae are clearly separated.  
► MALDI-TOF MS is fast, precise and economic for identification of animal Pasteurellaceae.

**A fluorometric method for evaluation of pharmacological activity against intracellular Leishmania amastigotes**  
Pablo Bilbao-Ramos, Sergio Sifontes-Rodríguez, María Auxiliadora Dea-Ayuela, Francisco Bolás-Fernández

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**Highlights**

► This new fluorometric method is highly sensitive and easy to perform.  
► It is suitable for quantification of intracellular viable Leishmania parasites.  
► The fluorometric assay is scalable for high throughput.  
► It could be validated for screening of new antileishmanial agents.

**Probe-based real-time PCR method for multilocus melt typing of Xylella fastidiosa strains**  
Jeff A. Brady, Jennifer B. Faske, Rebecca A. Ator, Jessica M. Castañeda-Gill, Forrest L. Mitchell

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**Highlights**

► A 1.5 hour DNA probe-melt genotyping real-time PCR reaction for Xylella fastidiosa.  
► 9 loci genotyped by adjacent-binding DNA probes.  
► $0.17 USD of reagents are used per PCR reaction.  
► Works on DNA from environmentally-isolated samples (no culturing required).  
► Robust even when unexpected genetic variation is encountered.

**Minimum taxonomic criteria for bacterial genome sequence depositions and announcements**  
Matthew J. Bull, Julian R. Marchesi, Peter Vandamme, Sue Plummer, Eshwar Mahenthiralingam

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**Highlights**

► Accurate taxonomic placement is essential for bacterial genomes.  
► Definition of taxonomic criteria for genome sequence announcements.  
► 16S rRNA gene phylogeny is a useful primary analysis of genome classification.  
► Phylogenies of two or more protein coding genes brings finer taxonomic resolution.  
► The Lactobacillus acidophilus 30SC genome originates from Lactobacillus amylovorus.
Quantitative methods for the analysis of zoosporic fungi

A method for the specific detection of resident bacteria in brine shrimp larvae
Yufeng Niu, Tom Defoirdt, Anamaria Rekecki, Peter De Schryver, Wim Van den Broeck, Shuanglin Dong, Patrick Sorgeloos, Nico Boon, Peter Bossier

A comparison of two approaches to extracting Cryptosporidium DNA from human stools as measured by a real-time PCR assay

Reevaluation of colorimetric iron determination methods commonly used in geomicrobiology
Juliane Braunschweig, Julian Bosch, Katja Heister, Christine Kuebeck, Rainer U. Meckenstock

Application of pyrosequencing for Salmonella enterica rapid identification
Xiujuan Li, Fang Yang, Weili Gao, Hongmei Song, Huifang Tian, Baohong Xu

Development of a reinforced Ti-eviction plasmid useful for construction of Ti plasmid-free Agrobacterium strains
Shinji Yamamoto, Katsunori Suzuki

Identification of Erwinia species isolated from apples and pears by differential PCR
I. Gehring, K. Geider

► The described PCR assays use primers from sequence mismatches of *Erwinia* species ► The selective primers are designed from housekeeping genes ► The method only depends on two consecutive primer annealing temperatures ► The differential PCR can confirm diagnostic data and identify bacterial species

**Rapid identification of *Fusarium graminearum* species complex using Rolling Circle Amplification (RCA)**
Mahdi Davari, Anne D. van Diepeningen, Assadollah Babai-Ahari, Mahdi Arzanlou, Mohammed Javad Najafzadeh, Theo A.J. van der Lee, G. Sybren de Hoog

► Rolling Circle Amplification (RCA) of *Fusarium graminearum* species complex. ► Rolling Circle Amplification (RCA) probes specific for different *Fusarium* spp. ► Identification of *Fusarium* in pure culture and contaminated wheat samples. ► Gel electrophoretic and direct visualization of RCA products. ► Sensitive and cost effective identification of *Fusarium* Head Blight species.

**Rapid identification of oral isolates of *Aggregatibacter actinomycetemcomitans* obtained from humans and primates by an ultrafast super convection based polymerase chain reaction**
M. Karched, D. Furgang, N. Sawalha, D.H. Fine

► We present a rapid PCR method that is completed in 35 min. ► Sensitivity and specificity of this technique are comparable to conventional PCR. ► *A. actinomycetemcomitans* detection was similar in 40 human samples tested. ► Twenty seven of 32 rhesus monkeys were shown to harbor *A. actinomycetemcomitans*.

**A filter-based propidium monoazide technique to distinguish live from membrane-compromised microorganisms using quantitative PCR**
Kristen N. Hellein, Elizabeth M. Kennedy, Valerie J. Harwood, Katrina V. Gordon, Shiao Y. Wang, Joe Eugene Lepo

► PMA differentiation of live-dead PCR targets adapted to membrane-filtered waters. ► An array of 16 blue LEDs replaced quartz-halogen activation of PMA on bacteriological filters. ► We compared qPCR Ct of DNA from "live" and "dead" filtered samples. ► PMA treatment inhibited PCR of bacterial DNA from "dead" but not "live" samples. ► Similar results were obtained at three independent laboratories.

**Development of RNA aptamers for detection of *Salmonella Enteritidis***
Ji-Yeon Hyeon, Jung-Whan Chon, In-Soo Choi, Chankyu Park, Dong-Eun Kim, Kun-Ho Seo
Microplate-based active/inactive 1° screen for biomass degrading enzyme library purification and gene discovery
Kurt Wagschal, Charles C. Lee

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