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Problems associated with shellfish farming

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Summary
Shellfish culture is a major sector of aquaculture production worldwide, and zoonoses and drug residues associated with shellfish farm practice are of concern to public health. This paper focuses on three of the most important shellfish species: molluscs, crabs and shrimp. Although many diseases can affect shellfish, they do not appear to be transmittable to humans. Rather, the main hazards are associated with the methods used to farm the different species. The risk to human health from shellfish most commonly relates to contamination by biotoxins produced by marine algae. Another well-recognised problem associated with shellfish culture is the contamination of shellfish with domestic sewage that contains human pathogenic bacteria and viruses, which causes diseases such as typhoid fever and hepatitis. In shrimp farming, the main potential food safety hazards are zoonoses, chemical contamination and veterinary drug residues. Untreated effluent from shrimp farms is a major concern to the environmental sector as it is known to promote plankton blooms if directly discharged into natural water sources.

Keywords
Amnesic shellfish poisoning – Crab – Diarrhetic shellfish poisoning – Dinoflagellate – Food safety – Mollusc – Neurotoxic shellfish poisoning – Paralytic shellfish poisoning – Red tide – Shellfish farming – Shrimp – Toxic algae bloom – Vibrio cholerae.

Introduction

Shellfish aquaculture has continued to expand, with an ever-increasing consumer demand for shellfish-derived products worldwide, and a wide variety of different species of shellfish are cultured in various systems around the world. Increased population and human activity in the world's coastal regions continue to harm the environmental quality of near-shore waters. This increasing anthropogenic degradation of the coastal environment also has a negative effect on the quality and quantity of coastal shellfish culture. The use of intensive or super-intensive culture systems in the production of some shellfish species, involving factors such as heavy stocking densities and the use of feed, chemicals and drugs, can easily have a detrimental impact on the local environment. Such intensive methods of culture can also be responsible for the production of potentially unsafe shellfish products for the consumer market. The issue of food safety and quality is of paramount concern to the consumers of both importing and exporting countries, and particularly important for the shellfish industry, which needs to maintain consumer confidence in its products. Food safety hazards associated with shellfish farming generally vary according to the species and the type of culture system. This paper will therefore provide information on hazards that may occur during the production stages and can affect the safety of shellfish food. The paper will focus on the three main groups of shellfish farmed around the world: molluscs, crabs and shrimp.

Mollusc farming

The molluscs are among the most successfully cultured and commercially important types of shellfish, and a large variety of different mollusc species are cultured throughout the world. Some, such as oysters and abalones, have a very high market value. Molluscs are generally cultivated in inshore coastal areas, using bottom and hanging/pole-culturing systems. The main species cultured are clams, mussels, oysters and abalones.

Clams

Canada is one of the major producers of the Manila clam (*Tapes philippinarum*), which is one of the most commonly cultured species. The clam culture system involves three principal stages of production: seed production, nursery rearing and the grow-out stage. All three stages can be undertaken by large-scale clam farmers, but clams are usually cultured in separate specialised farms at each of the three stages. Hatcheries maintain the broodstock for seed production, which is sold to growers or nursery units. The seed can be raised to the specific sizes that growers prefer, as larger seed normally has a higher survival rate, thus making production more predictable. After the seeds have been removed from the nursery area, they will be spread on prepared sub-tidal plots where they will grow to a marketable size.

Mussels

Two mussel species (*Mytilus edulis* and *M. galloprovincialis*) are the principle types of cultured mussel on the coasts of the Netherlands, France and Spain. In New Zealand the green-lip mussel (*Perna canaliculus*) is the main cultured species of choice. In most Asian countries, mussel seed stock is collected from the wild, whereas in Western countries such as Canada the seed stock is supplied by hatcheries. The seed stock may be nursed on suitable surface materials or set on framed screens. After three months of nursing, the mussels are ready to be hung or 'socked' in the grow-out systems. A variety of systems are utilised for the grow-out in order to reduce losses of stock from predation. Both off-bottom systems, such as the suspended long-line and raft methods, and bottom culture techniques are used.

Oysters

The most commonly cultured species of oyster is the Pacific oyster (*Crassostrea gigas*). Other species that are grown to a lesser extent include the Pacific Kumamoto oyster (*C. sikamea*), European oyster (*Ostrea edulis*) and Eastern oyster (*C. virginica*) (6). Oyster culture methods vary widely, because many different factors – including substrate type, current velocity, tidal range and phytoplankton productivity – are important for culturing a specific species. Bottom culture is primarily practised by spreading the spat over the selected area in the bay and growing the young oysters to marketable size. However, to overcome predation problems, the off-bottom technique has been developed to give a variety of different methods, such as the hanging and rack systems. Another advantage of the off-bottom system is that the oysters are suspended in the water column, and less silt therefore accumulates on the oyster.

Abalones

Abalone (*Haliotis kamtschatkana*) is a high-value species for the Japanese market. The culture cycle consists of a hatchery phase, a juvenile phase, and a grow-out phase. Culture systems include the land-based tank system and suspended system (34). The land-based tank system with a seawater pumping unit is the most common type, but a suspended system in seawater has also been used with various types of containers, including plastic cages, plastic barrels and mesh pouches.

A significant biological barrier in the culture of abalone is the slow growth rate, which currently makes it one of the most expensive shellfish to culture. The culture technique requires a fully supplemented specific feeding regime for each of the various stages of abalone culture. For the hatchery stage, the young larvae must be fed on benthic algae and diatoms which have been coated onto a selected surface. The water-flow system and aeration must be regulated to adequately replenish the algal film for the larvae until they reach the juvenile stage. The young abalone is subsequently fed with macro-algae or feed pellets in the grow-out system.

Hazards to human health

Bivalves are filter-feeders and feed on a wide range of phytoplankton species in the marine environment. Filter-feeders are particularly susceptible to sudden blooms of phytoplankton organisms, which can occur in nutrient-enriched coastal areas and may contain biotoxins that are hazardous to human health. These toxic algae blooms are frequently referred to as 'red tides' in the popular literature. Paralytic shellfish poisoning (PSP) is one of the most serious diseases associated with red tides, and consumption of shellfish exposed to red tide blooms can result in high human mortality. In the Philippines consumption of shellfish exposed to an algal bloom of *Pyrodinium*, a toxic dinoflagellate, resulted in the deaths of at least 21 people and the hospitalisation of over 200 others in June to August 1983 (22). Bivalves affected by red tides do not generally die, but tend to accumulate toxins within their flesh. Depuration studies have shown that bivalves can be depurated, but a long time is required to make contaminated shellfish safe for human consumption, and this option is therefore uneconomical at present.

Another problem associated with filter-feeding bivalves is their susceptibility in estuarine and coastal areas to contamination with domestic sewage, which is known to contain bacteria and viruses that are pathogenic to humans. Again it is known that these pathogens can accumulate in the flesh of bivalves. Major disease risks from this source are typhoid and paratyphoid fever, salmonellosis, *Vibrio parahaemolyticus* infection, cholera, viral hepatitis type A and viral gastroenteritis. Contaminated bivalves can be made edible by:

a) re-laying, or transferring the shellfish to pollution-free waters

b) depuration.

These processes are expensive and require large inputs of time and labour.

Diarrhetic shellfish poisoning (DSP) is a food-borne illness caused by the consumption of shellfish that contain biotoxins produced by dinoflagellates belonging to the genera *Dinophysis* and *Prorocentrum* (37, 38). It is a gastrointestinal disease with no neurological symptoms. The first reported cases occurred in the Netherlands in the 1960s (1), and since then outbreaks have been described in Japan, Europe, South America, and the Far East. In Antwerp, Belgium, 403 cases of DSP were reported in February 2002 after consumption of blue mussels that contained biotoxins specific to dinoflagellates. The mussels were imported from Denmark and were part of a batch presenting high concentrations of okadaic acid above the regulatory limits (9).

The cause of DSP is a group of polyethers, including okadaic acid, dinophysis toxins, pectenotoxins and yessotoxin (5). Poisoning caused by these toxins is probably under-diagnosed and under-reported in many parts of the world because of the non-specific symptoms and because the disease itself is often limited and mild.

The much more serious PSP is due to a toxin produced by single-celled dinoflagellate algae of the genus *Alexandrium* which causes neurological symptoms that include paralysis, numbness and disorientation (25). The toxicity of PSP is estimated to be 1,000 times greater than cyanide and all cases require immediate medical attention.

Apart from PSP, algal biotoxins can also cause amnesic shellfish poisoning (ASP) and neurotoxic shellfish poisoning (NSP) in people who consume contaminated shellfish. These toxins can also have adverse effects on fish, shore birds and marine mammals. The cause of ASP is domoic acid, found in marine algae and some species of diatoms. It is accumulated in a number of filter-feeding bivalve molluscs, including mussels, clams, scallops and oysters. The symptoms of ASP may vary from nausea, vomiting and diarrhoea to muscle weakness, disorientation and memory loss (4). Although ASP is relatively uncommon, cases have occurred in eastern Canada, North America, Spain, Ireland and Scotland, causing illness and death.

The alga *Karenia brevis*, which produces brevetoxin, causes the gastrointestinal and neurological symptoms of NSP. Affected people can recover completely in a few days and no deaths due to the syndrome have been reported. Another algal toxin hazard is azaspiracid poisoning (AZP), produced by a dinoflagellate species, *Protoperidinium* sp., which also causes vomiting, diarrhoea, abdominal pain and headache. In addition, AZP may have serious long-term impacts, such as the development of pneumonia and lung tumours.

In Spain, cases of *V. parahaemolyticus* infections are now more common in hospitals than previously. The organism has been isolated from patients with gastroenteritis in the areas where most Spanish shellfish are produced. Before 2004, most Spanish clinical isolates were serotype 04:K11, which was shown to be a unique clone distinct from Asian and American clinical strains. By mid-2004, however, all isolates of *V. parahaemolyticus* from the patients were 03:K6, which exhibited a pattern indistinguishable from those of pandemic strains from Asia. The pandemic 03:K6 clone of *V. parahaemolyticus* appeared in Asia around 1996. It spread to the United States in 1998 and more recently to Chile, where it has caused hundreds of infections, resulting in the first *V. parahaemolyticus* pandemic in history. The emergence of this virulent serotype in Europe is a serious public health concern that demonstrates the need to include *V. parahaemolyticus* in microbiological surveillance and re-examine control programmes in Europe for shellfish-harvesting areas and ready-to-eat seafood (24).

The way forward

A programme for the comprehensive monitoring and regular analysis of molluscs should be implemented to provide an early warning to the public of the appearance of biotoxins in molluscs. Samples of molluscs in growing areas should be regularly collected and tested for shellfish poisons. When the toxin level exceeds the regulatory limit, the growing area should be quarantined and sale prohibited, and the public health authorities should be informed. The programme should include a routine assessment of coastal resources for the presence of marine biotoxins and toxic phytoplankton blooming before public health is threatened. Some biotoxins may be associated with certain seasons. For instance, although azaspiracid-contaminated shellfish can occur in all seasons, the prevalence is much higher in the summer months (18). Therefore, the biotoxin distribution of each area, which may vary with the seasons, should be well documented in each country to support provision of public health measures.

Crab farming

Crab aquaculture has been practised for many years in Southeast Asia and is an important source of income among fish farmers. Crab culture operations have not expanded to the level of shrimp or prawn culture, and stocking densities are comparatively low.

Aquaculture of mud crabs has been conducted for at least a century in the People's Republic of China (36) and for the past 30 years throughout Asia (19). Crab farming is a relatively simple aquaculture practice. Traditionally, mud crab culture was based on stocking wild-caught juveniles and adults for grow-out culture and fattening. Although hatchery production of megalopae is now feasible, the initial source of spawners and broodstock is mostly wild stock. Four species of mud crabs (*Scylla* sp.) are distributed in the Indo-Pacific region: *S. serrata, S. olivacea, S. tranquebarica*, and *S. paramamosain*. They are all currently recognised for culture purposes. *Scylla serrata* is the most commonly farmed species in many Southeast Asian countries and Australia (7), while *S. olivacea* and *S. paramamosain* are the two common species farmed in the lower Mekong Delta (23).

There are two types of land-based mud crab aquacultures; one involves fattening crabs with low flesh content, and the other is grow-out of juveniles to a marketable size. Mangrove ponds/pens are used to operate two kinds of system: an intensive system with high stocking rates and supplementary feeding, and an extensive system where the stocking rate is low and there is no supplementary feeding (19). Various chemicals are used to control or treat disease, including malachite green, copper sulphate and zinc sulphate (20).

Hazards to human health

Vibrio cholerae is a natural bacteria occurring in brackish and estuarine waters, which can cause diarrhoea in humans. *Vibrio cholerae* O1 was isolated from blue crabs in Malaysia in 2003 (11). A case of cholera occurred in a patient in Maryland, who had eaten crab harvested commercially along the Texas coast in October 1984 (21). Findings of *V. cholerae* in the hindgut of crabs are considered to be correlated with the epidemiology and transmission of cholera in the aquatic environment (16).

The way forward

Crab or crab meat is normally cooked before consumption, so the health risk is low. However, contamination with bacteria that can cause human diseases may occur during the processing of crab meat, and food safety regulations should therefore be strictly applied.

Shrimp farming

The shrimp industry has grown very rapidly in the last two decades, with a wide variety of different shrimp and prawn species being cultured in many parts of the world. The two predominant areas for large-scale culture today are Asia and South America. The giant freshwater prawn, *Macrobrachium rosenbergii*, has been cultured in many Southeast Asian countries for more than four decades (27). Pacific white shrimp (*Litopenaeus vannamei*) is widespread along the eastern coast of the Pacific Ocean from Mexico to northern Peru (15, 28). More recently, culture of the black tiger shrimp, *Penaeus monodon*, has been booming in many regions.

Most Latin American countries, such as Brazil, Ecuador, Panama, Peru and Mexico, use a semi-intensive system for culturing white shrimp (2). However, since the outbreak of white spot syndrome virus in Latin American countries in 1999, some farms have changed to an intensive culture system with smaller pond sizes. In Asia, the black tiger shrimp is currently the most widely cultured type, particularly in Thailand, Indonesia, India, Vietnam, Sri Lanka, the Philippines and Malaysia. These countries together contribute about 60% of the world's total cultured shrimp production (10). Most countries in Asia use semi-intensive culture systems, but Thailand, the leading shrimp exporter for over ten years, uses an intensive culture system.

Currently, shrimp farming in Asia is undergoing a dramatic transformation. The white shrimp (*L. vannamei*) is rapidly replacing the giant or black tiger shrimp as the main farmed species. This change began in Taipei China in the late 1990s with the importation of specific-pathogen-free (SPF) broodstock of *L. vannamei* from Hawaii. The People's Republic of China then began to import this broodstock, followed by Thailand, Indonesia and Vietnam, and the white shrimp is now being cultured on a very large scale. The main reason for this change is that *L. vannamei* has a faster growth, higher yield and lower production costs than *P. monodon*. The biological basis of this advantage is the SPF and domestication status of imported *L. vannamei*. In contrast, *P. monodon* post-larvae are produced from wild-caught broodstock and are both non-domesticated and contaminated with pathogens.

The impacts of shrimp farming can be categorised into two groups, environmental impact and hazards to human health.

Impact of shrimp farming on the environment

In the past, most shrimp farms in Southeast Asia were located in mangrove forests and used extensive culture systems. Shrimp seed was typically obtained from the wild as post-larvae, either passively in water that was pumped into the ponds, or through the collection from one location of post-larvae which were then transferred into ponds at other locations. This type of shrimp culture destroyed large areas of mangrove forests, which are the spawning ground for many species of aquatic animals, including shrimp. Mangrove forests can also protect land from waves and storms, and even offer considerable protection from such catastrophic events as tsunami. In the future, no aquaculture farming – including shrimp culture – should exploit these important areas.

There is growing concern about environmental pollution from the rapid expansion of shrimp farm areas. In the intensive shrimp culture system, pollution from shrimp farms is directly related to excessive use of feed. The effluents from the ponds are flushed out into the surrounding water resources during the culture period or after harvest. The major components of the wastes are dissolved nutrients such as ammonia, nitrogen, carbon dioxide and phosphorus; suspended organic solids such as faeces and phytoplankton; and inorganic suspended solids such as clay particles. These wastes often exceed the natural biological capacity to degrade such materials, leading to widespread eutrophication and degradation of the environment in many areas.

The way forward

In order to stop the harm caused to surrounding areas by waste from shrimp farms, shrimp culture practice should be based on a recirculation system. In such a system, wastewater from shrimp culture is reused after it has been treated in various ways. The treatment processes ensure water quality, make better use of the water, and at the same time protect the environment by reducing the waste discharge. The treatment units are described in the following sections.

Sedimentation pond

This first treatment involves storing wastewater in a pond to remove by sedimentation any settable solids that are present. Aeration of the pond water can be used to enhance the sedimentation process and help oxidise waste organic material. The aeration process also facilitates the oxidisation of toxic gases such as ammonia, nitrite and hydrogen sulphide into other more harmless compounds. For small shrimp farms, water from cultured ponds should be kept in the sedimentation pond for an appropriate period of time (until the water quality parameters meet national requirements or regulations) before it is discharged outside the farm into surrounding water.

Fish or other filter-feeding organisms

These organisms are involved with the secondary treatment pond. Filter-feeding fish such as tilapia or mullet are the most common species recommended. These fish species remove any waste organic material that remains suspended in the water after the sedimentation process. Water from these ponds will then be reused for shrimp ponds during the different cycles.

Hazards to human health

Potential food safety risks associated with shrimp aquaculture will vary according to the system that is used. Hazards may include biological contaminants such as pathogenic bacteria, or chemical contamination by agro-chemicals, veterinary drug residues and heavy metals. The reasons for these food safety hazards are very diverse, ranging from poor aquacultural practices to cultural habits of food preparation and consumption.

Improper management by shrimp culturists in many countries during the grow-out period can cause human health problems. Organic fertilisers are widely used to promote phytoplankton blooms as a food source for the shrimp in the first stage of shrimp culture. Materials used to promote these blooms have included animal manures, grass, by-products from the harvesting or processing of agricultural products, waste from fisheries and aquaculture processing plants, and discarded fish. In some instances discarded fish and processing wastes have been used not only as fertiliser but as feed. Most of these bloom-creating materials clearly have the potential to introduce serious contamination hazards into the shrimp under culture conditions.

The use of uncooked organisms and their by-products as feed in shrimp ponds can also promote the spread of shrimp diseases. Such raw food has a high oxygen demand that can degrade pond-water quality and so affect the health of the shrimp.

Shrimp producers do not intentionally dispose of human sewage in ponds, but some farms draw water from rivers or estuaries that receive untreated human waste in the immediate vicinity of the farm. Wastes of human and animal origin are a source of pathogenic organisms that may be transmitted to humans via the products of aquaculture. Disease transmission associated with aquaculture use of excreta and wastewater has been reported by the International Reference Centre of Waste Disposal (17). There are potential health hazards for humans who consume inadequately cooked shrimp grown in ponds that receive human waste, untreated animal manure or organic fertilisers containing salmonella or other food-poisoning organisms.

Most countries culture shrimp for export. The greatest problem affecting the export of frozen shrimp is contamination by microorganisms that are pathogenic to humans, especially *Salmonella* and pathogenic *Vibrio* spp. Environmental sources of these organisms include water, soil, insects, animal faeces, raw meats, raw poultry and raw seafood. *Salmonella typhi* and the paratyphoid bacteria cause acute disease, normally septicaemia, and produce typhoid or typhoid-like fever in humans. Other forms of salmonellosis generally produce milder, gastrointestinal symptoms and have led to public health problems in various countries. *Salmonella* has been detected in samples of the water supply, pond water (3, 31), feed materials, fresh shrimp at farms (29, 31) and from wholesale markets, and frozen shrimp destined for export (32, 33, 35).

Both *V. cholerae* O1 and *V. cholerae* non-O1 have been isolated from water of shrimp cultured in brackish water in Southeast Asia, with *V. cholerae* O1 present in 2% and *V. cholerae* non-O1 in 33% of samples (8, 31). In similar studies, *V. cholerae* non-O1 was isolated from shrimp culture environment in India (26).

Antibiotics

Current knowledge of the health and environmental impact of antibiotics used in aquaculture is poor, particularly in tropical regions. Improper use of antibiotics in hatcheries and grow-out ponds will result in antibiotic residues in cultured shrimp. Most importing countries have prohibited the use of chloramphenicol and nitrofurans in aquaculture.

The Food and Drug Administration in the United States of America (USA) banned the powerful and potentially toxic chloramphenicol (one of the phenicols) in 1989 because of the risks of antibiotic resistance developing in human pathogens and a link with a rare and often fatal disease, aplastic anaemia (13). Chloramphenicol is highly toxic to humans, but the antibiotics are used to treat humans in life-threatening situations when no other drug is effective. Europe, Japan and many other countries also banned the antibiotic in feed, but it is still permitted for specific veterinary treatments.

Nitrofurans are also dangerous because of their potential carcinogenic properties, and so their use in animals produced for human consumption is similarly banned in the European Union and the USA (12, 14). The USA is comparatively strict in this respect, limiting the use of antibiotics in aquaculture to three drugs: oxytetracycline, sulphamerazine, and a drug combination containing sulphadimethozine and ormethoprime. The occurrence of antibiotic residues in cultured shrimp from several exporting countries from Asia has led to rejection of the product in export markets.

The way forward

The use of chemical fertilisers, properly treated organic manure and pellet feed in ponds should be encouraged. Some uncooked food organisms may be allowed in broodstock ponds where special diets are needed for gonadal maturation, but this is an exceptional circumstance. Certified farms should not use any untreated manure or uncooked organisms in grow-out ponds.

Human waste and untreated animal manure must be prevented from entering grow-out ponds. Domestic sewage should always be treated to prevent the contamination of the surrounding areas, and raw sewage should never be discharged into shrimp ponds from canals or natural water sources under any circumstances. Septic runoff from human and animal sources should also be avoided. Waste treatment systems should be maintained adequately to ensure that they do not leak into ponds or farm canals, and toilets should not be located near farm canals, farm reservoirs or shrimp ponds. Shrimp farms should have a reservoir as part of their farming system to act as a holding facility for water or as a pre-treatment pond. Water from rivers or canals should be pumped into this pond to allow organic matter and suspended solids to settle out. This practice can reduce much of the bacteria in cultured ponds.

Hatcheries should pay particular attention to the use of natural organic foods and unadulterated artificial feed to produce good-quality post-larvae. The use of drugs such as chloramphenicol and nitrofurans at any stage of production should be prohibited. When antibiotics are used according to the regulations of each country and recommended safety guidelines, foods from the aquatic food chain are unlikely to pose any serious public health risks from antibiotic residues. Antibiotic use should be curtailed as much as possible to prevent the development of antibiotic-resistant bacteria in the food chain. Food safety hazards associated with products from aquaculture and the proposed application of principles of the hazard analysis and critical control point (HACCP) system have been reviewed in order to develop a general strategy to control the hazards identified (30).

Record keeping is an essential part of good aquacultural practice and is important for HACCP implementation. The preparation of the HACCP plan, including updating and implementation, must be fully documented. Generally, records should be kept for a period of two years and be available for inspection by a regulatory authority.

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Les problèmes liés à l'élevage des mollusques et des crustacés

S. Chinabut, T. Somsiri, C. Limsuwan & S. Lewis

Résumé

L'élevage des mollusques et des crustacés représente un sous-secteur important de l'aquaculture dans le monde. Les risques de zoonoses et de résidus de médicaments associés aux pratiques d'élevage de ces espèces posent de véritables problèmes de santé publique. Les auteurs abordent trois des principales espèces concernées : les mollusques, les crabes et les crevettes. Ces espèces sont sensibles à de nombreuses maladies qui ne semblent toutefois pas transmissibles à l'homme. Le principal danger réside plutôt dans les méthodes d'élevage pratiquées. Les risques associés aux fruits de mer et pouvant menacer la santé publique sont le plus souvent liés à la contamination par les bio-toxines produites par les algues marines. Un autre problème connu affectant les élevages de mollusques et de crustacés est celui de la pollution par les eaux usées, qui contiennent des bactéries et des virus pathogènes pour l'homme et responsables d'infections telles que la fièvre typhoïde et l'hépatite. Concernant l'élevage de crevettes, les principaux dangers potentiels menaçant la sécurité sanitaire des aliments sont les agents zoonotiques, la contamination par des polluants chimiques et les résidus de médicaments vétérinaires. Le problème des effluents non traités rejetés par les fermes de crevettes représente un enjeu fondamental pour l'environnement, dans la mesure où il a été démontré que le déversement de l'effluent non traité dans les eaux naturelles favorise la prolifération de plancton.

Mots-clés

Crabe – Crevette – Dinoflagellé – Efflorescence toxique des algues – Élevage de mollusques et de crustacés – Intoxication avec effet d'amnésie – Intoxication diarrhéique – Intoxication neurotoxique – Intoxication paralysante – Marée rouge – Mollusque – Sécurité sanitaire des aliments – Vibrio cholerae.

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Problemas ligados a la conchilicultura

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Resumen

En términos de producción, las actividades conchilícolas (cría de mariscos) representa en todo el mundo una parte importante de la acuicultura, razón por la cual las zoonosis y los residuos de medicamentos asociados a esas actividades constituyen un motivo de preocupación en el terreno de la salud pública. Los autores se centran en tres de los más importantes grupos de animales conchilícolas: moluscos, cangrejos y camarones. Todos ellos pueden verse afectados por numerosas enfermedades, aunque éstas no parecen transmisibles al ser humano. Los aspectos más peligrosos de la conchilicultura derivan más bien de los métodos utilizados para criar a las distintas especies. El riesgo que presentan estos animales para el ser humano proviene generalmente de su contaminación por toxinas biológicas generadas por algas marinas. Otro problema bien conocido es el de la contaminación de los animales por aguas residuales domésticas que contengan bacterias y virus patógenos para el hombre, origen de enfermedades como la fiebre tifoidea o la hepatitis. En la cría de camarones, los principales peligros en cuanto a la inocuidad alimentaria radican en las zoonosis, la contaminación química y los residuos de medicamentos veterinarios. Los efluentes no tratados de los viveros de camarones suscitan gran preocupación en los círculos ligados al medio ambiente, pues se sabe que su vertido directo en aguas naturales promueve floraciones planctónicas.

Palabras clave

Camarón – Cangrejo – Conchilicultura – Dinoflagelado – Envenenamiento amnésico por mariscos – Envenenamiento diarreico por mariscos – Envenenamiento neurotóxico por mariscos – Envenenamiento paralítico por mariscos – Floración de algas tóxicas – Inocuidad de los alimentos – Marea roja – Molusco – Vibrio cholerae.

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