Ifremer
Genetic and Pathology Laboratory

Important pathogens and parasites of molluscs

Pathogen or parasite		Host species	Host impact	Geographical distribution	Infection period	Diagnostic	Cycle
Species	**Group**						
Bonamia ostreae	Protozoan	*Ostrea edulis*, *O. Conchaphila, O. Angasi, O. Puelchana, Tiostrea chilensis*	Parasite of oyster haemocytes (=>all the tissues can be invaded). Oyster mortality	Denmark, Netherland, France, Ireland, Great Britain (except Scotland), Italy, Spain and USA	Throughout the year (with a peak in September)	Incubation period : 3-4 month in infected area. Histology, tissue imprint, PCR, ISH, electron microscopy	Direct
Bonamia exitiosa	Protozoan	*Ostrea angasi, Ostrea chilensis, Ostrea edulis*	Parasite of oyster haemocytes (=>all the tissues can be invaded). Oyster mortality	Australia, New Zéland, Tasmania, Spain (in 2007)	Throughout the year (with a peak during Australian autumn)	Histology, tissue imprint, PCR, ISH, electron microscopy	Unknown
Haplosporidium costale	Protozoan	*Crassostrea virginica*	Parasites present in connective tissue (mantle, gonads, digestive gland) but not in digestive tubule epithelia. Mortality in May-June	USA, Canada	Spring-summer	Histology, tissue imprint, PCR, ISH, electron microscopy	Unknown
Haplosporidium nelsoni	Protozoan	*Crassostrea virginica, Crassostrea gigas*	Parasites present in gills, connective tissue. Sporulation only in the epithelium of digestive gland in *C. virginica*, Mortalities in *C. virginica.* No mortality in *C. gigas*	USA, Canada, Japan, Korea, France	Summer (May until October)	Histology, tissue imprint, smear, PCR, HIS, electron microscopy	Unknown but intermediate host is suspected
Haplosporidium armoricanum	Protozoan	*O. edulis, O. angasi*	Parasite present in connective tissue. Sometimes, mortality can be observed	France, Netherland, Spain		Histology, tissue imprint	Unknown
Marteilia refringens	Protozoan	*Ostrea edulis* , *Tiostrea chilensis*, *O. angasi* , *Mytilus edulis*	Extracellular parasite of the digestive gland. Oyster mortalities	France, Portugal, Spain	Spring-summer (Temperature > 17°C)	Histology, tissue imprint, ISH, PCR, PCR-RFLP, electron microscopy	Intermediate host: copepod (*Paracartia grani*)
Marteilia sydneyi	Protozoan	*Saccostrea glomerata, Striostrea mytiloides, Saccostrea forskali*	Parasite of palps, gills, the digestive gland. Oyster mortalities	Australia	Australian summer--autumn	Histology, tissue imprint, PCR, ISH, electron microscopy	Unknown
Marteilia maurini	Protozoan	*Mytilus edulis*, *M. galloprovincialis*	Parasite of the digestive gland. Sometimes, mortality can be observed	France, Italy, Spain, Portugal, Greece, Croatia		Histology, tissue imprint, ISH, PCR, electron microscopy	Unknown
Microcytos mackini	Protozoan	*Crassostrea gigas*, *C. virginica, Ostrea edulis, Ostrea conchaphila*	Green pustules on the mantle, palps. Intracellular parasites present in connective tissue cells. Oyster mortality	Canadian west coast, USA	From winter to late spring. Incubation period: 3-4 month in infected area (Temp. <10°C)	Histology, tissue imprint, PCR, ISH, electron microscopy	Direct
Microcytos roughleyi	Protozoan	*Saccostrea glomerata*	Abscess in the gonad, mantle, gills Parasite of oyster haemocytes (=>all the tissues can be invaded). Oyster mortality	Australia	Australian winter	Histology, PCR	Unknown
Perkinsus marinus	Protozoan	*Crassostrea virginica, C. gigas, C. ariakensis*	Parasite present in the connective tissue and epithelial cells. C. *virginica* mortalities	USA	Summer (Temperature > 20°C)	Histology, thioglycolate culture, PCR, electron microscopy	Unknown
Perkinsus olseni	Protozoan	*Haliotis ruber, H. laevigata, H. cyclobates, H. scalaris, Ruditapes decussatus, R. philippinarum, R. pullastra, Venerupis aurea…*	Nodules in the mantle, muscle, gills, digestive gland. Parasite present in connective tissue and epithelial cells. Abalone mortalities in Australia and clams mortalities in Portugal, Korea, China, Japan	Australia, New Zealand, Korea, China, Japan, France, Portugal, Spain, Italy		Histology, thioglycolate culture, PCR, electron microscopy	Direct
***Candidatus* Xenohaliothis californiensis**	Bacteria (Rickettsia)	*Haliotis cracherodii, H. rufescens* , *H. corrugata* , *H. fulgens* , *H. discus hannai, H. tuberculata, H. midae*	Atrophy of foot muscle. Bacteria in the epithelium of intestinal tract. Abalone mortalities	USA, Iceland, Spain, Ireland	Summer	Gross observation, histology, PCR, ISH, electron microscopy	Unknown
Iridovirus (different types of iridovirus exist)	Virus	*Crassostrea angulata, C. gigas*	*C. angulata* mortalities. *C. gigas* larvae mortalities in USA	Spain, France, Portugal, Great Britain, USA		Histology, electron microscopy	Direct

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Herpesvirus	Virus	*Crassostrea gigas, C. virginica, Ostrea edulis, O. angasi, Tiostrea chilensis, C. angulata, Saccostrea commercialis, Ruditapes decussatus, R. philippinarum, Pecten maximus*	Virus present in the connective tissues Sometimes larvae and juvenile mortalities	Europe, USA, Australia, New Zealand	Summer (Temperature > 19°C)	PCR, ISH, electron microscopy, histology	Direct
Mytilicola sp.	Copepod (metazoan)	*Marine bivalves (oyster, mussel, clam…)*	Parasites present in the gut lumen. Minimal impact on host	USA, Japan, Europe		Histology, gross observation	Direct
Myicola sp.	Copepod (metazoan)	*Marine bivalves (oyster, mussel, clam…)*	Parasites present in the gills. Minimal impact on host	Ubiquitous		Histology, squash preparation	Unknown
Rickettsia sp. Chlamydia sp. Mycoplasma sp.	Bacteria	*Marine bivalves (oyster, mussel, clam…)*	Bacteria present in the digestive gland, gills, kidney, epithelial cells. Minimal impact on shellfish	Ubiquitous		Histology, electron microscopy	Unknown
Pseudoklossia sp., Margolisiella sp.	Protozoan	*Marine molluscs (oyster, mussel, clam, scallop, abalone…)*	Parasites present in the digestive gland, gills, kidney, mantle epithelial cells, connective tissue Minimal impact on shellfish	Ubiquitous		Histology, squash preparation, electron microscopy	Unknown
Urastoma sp. Paravortex sp.	Plathelminthe (metazoan)	*Marine molluscs (oyster, mussel, clam, scallop, abalone…)*	Urastoma sp. is present in the gills *Paravortex* sp. is present in the digestive gland. Few impact on molluscs	Probably ubiquitous		Histology, whole mount, gross observation	Unknown
Labratrema sp. Meiogymnophalus sp. Himasthla sp. Prosorhynchus sp. Renicola sp. etc…	Plathelminthe (metazoan)	*Marine molluscs (oyster, mussel, clam, scallop, abalone…)*	Parasites present in connective tissues, gills, mantle. Variable impact on molluscs	Probably ubiquitous		Histology, squash preparation	Cycle with intermediate hosts Molluscs are often an intermediate host for the parasite
Marteilioïdes chungmuensis	Protozoan	*Crassostrea gigas, C. echinata (only the females)*	Nodule in the mantle (heavy infection) Parasite present in the ovocyte. Impact on oyster reproduction	Korea, Japan, Australia	Summer	Histology, smear, ISH, electron microscopy	Unknown
Marteilioïdes branchialis	Protozoan	*Saccostrea glomerata*	Parasite of gill epithelial cells	Australia		Gross observation, histology, electron microscopy	Unknown
Family of Papovaviridae	Virus	*Crassostrea virginica, Crassostrea gigas, Saccostrea glomerata, Crassostrea rhizophorae, Ostrea edulis, Ostrea concaphila, Pinctada maxima, Mya arenaria, Macoma baltica.*	Virus present in connective tissues, gametocytes	USA, Korea, Japan, France, Australia		Histology, electron microscopy	Direct
Vibrio tapeti,s Vibrio harveyi, Vibrio splendidus, Vibrio pectinicida etc…	Bacteria	*Marine molluscs (oyster, mussel, clam, scallop, abalone…)*	Bacteria in all tissues Variable impact on molluscs	Ubiquitous		Histology, culture, PCR, slide agglutination test, DNA sequencing	Direct
Polydora sp.	Polychaetes (Metazoan)	*Marine molluscs (oyster, mussel, clam, scallop, abalone…)*	Parasite present in mollusc shell. Variable impact on molluscs	Ubiquitous	Spring/summer	Gross observation, wet mount	Direct
Ostracoblabe implexa	Fungus	*Ostrea edulis, Crassostrea gigas, Saccostrea cucullata, Crassostrea angulata*	Shell abnormalities	Europe, India, Canada	Summer (temperature >22° C)	Gross observation, histology, culture, squash preparation	Unknown
Nematopsis sp.	Protozoan	*Marine molluscs (oyster, mussel, clam, scallop, abalone…)*	Parasite present in connective tissue, gills. Few impact on molluscs	Ubiquitous		Histology, electron microscopy	Cycle with intermediate hosts. Molluscs are generally intermediate hosts for the parasite

In red: Pathogens listed by the European Commission
In blue: Species found in Europe
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