Non-indigenous marine species in the Netherlands

Issued by The Department of Nature & Biodiversity of the Ministry of Agriculture, Nature and Food Quality & the Office for Risk Assessment and Research of the Netherlands Food and Consumer Product Safety Authority.

A. Gittenberger
M. Rensing
K.H. Wesdorp

GiMaRIS
tenberger marine research inventory strategy

GiMaRIS report 2017_13

Date:
November 2017

Report nr.:
GiMaRIS 2017_13

Title:
Non-indigenous marine species in the Netherlands

Authors:
Dr. A. Gittenberger
Drs. M. Rensing
K.H. Wesdorp Msc.

Address GiMaRIS:
GiMaRIS
J.H. Oortweg 21
2333 CH Leiden
Info@GiMaRIS.com
www.GiMaRIS.com

Issued by:
The Department of Nature & Biodiversity of the Ministry of Agriculture, Nature and Food Quality & the Office for Risk Assessment and Research of the Netherlands Food and Consumer Product Safety Authority.

Clients:
Dr. E. Knegtering (Ministry of Agriculture, Nature and Food Quality, Department of Nature & Biodiversity)
Drs. A.A.J. Smolders (Office for Risk Assessment and Research, Netherlands Food and Consumer Product Safety Authority)

Abstract

The present report includes an overview of non-indigenous species recorded in brackish to marine waters in the Netherlands. These waters include the North Sea, The Wadden Sea, the Oosterschelde, the Westerschelde, the Grevelingen, the Veerse Meer, the Kanaal van Walcheren, the Noordzeekanaal and the Eems estuary. The list includes a total of 178 species, of which 153 species find their origin outside of North-West Europe. Based on the known habitat preferences and the number of records it is assumed likely that 54 of these 153 species are settled in the Dutch part of the North Sea. Also including the more inland slightly brackish to marine waters, like the Westerschelde, Oosterschelde, Grevelingen, Noordzeekanaal and Wadden Sea, 140 non-indigenous species, originating from outside North-West Europe, have probably settled. The number of new records of non-indigenous species for the Netherlands appears to be decreasing in recent years. From the present study it cannot be concluded however to what degree this is linked to varying monitoring effort and to what degree this is linked to a decrease of the number of new introductions. Marine traffic is steadily increasing within Europe over the past years. This can therefore not explain a decrease in records of new species. Shellfish transports, ballast water transports and hull fouling have been more or less equally responsible for the primary introduction of non-indigenous species in North-West European waters. The main secondary vectors with which these species were subsequently distributed throughout North-West European waters concern natural distribution and hull fouling. These are also the two main vectors with which non-indigenous species, which settled in the Dutch part of the North Sea, were introduced in the Netherlands. For non-indigenous species in the Netherlands that have settled in more inland waters, shellfish transports have also been an important import vector. These shellfish transports concern mainly the Pacific oyster imports of the late 20th century, which are nowadays prohibited.

Introduction

To assess, evaluate and potentially develop effective management of the risk of non-indigenous species, described, for example, by descriptor D2 of the Marine Strategy Framework Directive, it is necessary for governments within the EU to have a good understanding of the marine non-indigenous species in their waters. For this reason the present report was made in order to provide an overview of non-indigenous species recorded in slightly brackish to marine waters in the Netherlands, including data on their introduction and distribution. This project was commissioned by the Dutch Department of Nature & Biodiversity of the Ministry of Agriculture, Nature and Food Quality and the Office for Risk Assessment and Research of the Netherlands Food and Consumer Product Safety Authority.

Methods

An overview was made of non-indigenous species that were recorded in marine to slightly brackish (>5 ppt) waters in the Netherlands, i.e. in mesohaline, polyhaline and euhaline waters. Species were only included if it is assumed likely that they have been aided by humans in their spread outside of their native region. Southern European species that have probably extended their populations to the north because of climate change, are therefore not included on this list. The overview that is present here, was constructed based on various sources like the species list by Bos *et al*. (2017), which is focused on species recorded in the North Sea, the list of Gittenberger (2009) which focuses on exotic species recorded in the Oosterschelde, the Voordelta and connected waterways, the list of Gittenberger *et al*. (2015a) focusing on species in the Wadden Sea, and the Dutch species register (www.soortenregister.nl).

In addition to these three sources, an extended literature study was done and the internet was searched for potentially still unpublished recent records of non-indigenous species.

For all species it is indicated whether they are considered to be native or non-indigenous to North-West European waters. For each non-indigenous species the most likely vector was assessed with which they were primarily introduced into North-West European waters and distributed secondarily along the North-West European coast (Fig. 1). In addition the most likely vector was assessed with which these species were introduced into the Netherlands. These assessments were done based on the expert opinions of the authors taking the life history strategies and invasion history of these species into account. Most species can be distributed by various vectors and have been transported by accident. It therefore remains impossible to know for certain with which vector they were introduced. The resulting figures provide indications of the most probable transport vectors of these

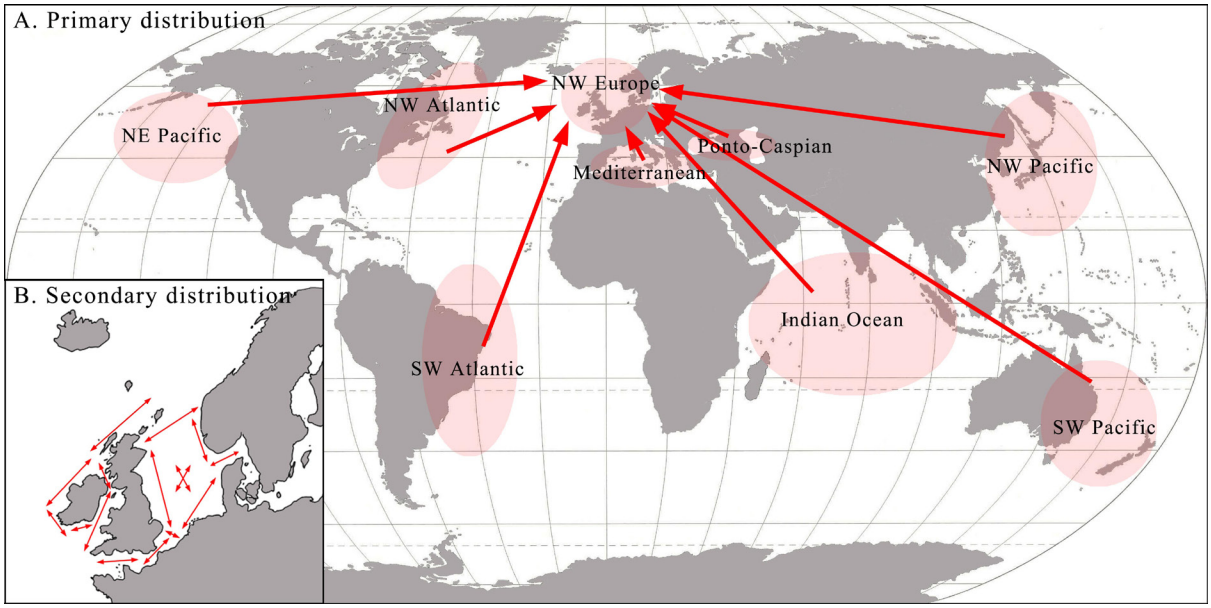

Fig. 1. Primary and secondary distribution of marine non-indigenous species to and within North-West European waters; [A] Primary distribution of non-indigenous species concerns the distribution of non-indigenous species from their place of origin (where they are native) to a site where they are non-indigenous. [B] Secondary distribution concerns the distribution of non-indigenous species in a region where they were first introduced by primary distribution.

non-indigenous species. This list only includes non-indigenous species for which specimens were recorded that were probably alive and may have settled. It does not include species of which, for example, only specimens were found that washed ashore. Based on the known habitat (mostly salinity) preferences, and the number of records, it was assessed for each species whether or not it is logical that it has settled in either the Dutch North Sea or in one of the more inland slightly brackish to marine waters of the Netherlands. Although all species recorded are included in the appendixes, the transport vector analyses in the present study are only based on species that have probably settled. This is done separately [1] for species in the Dutch North Sea and [2] for species in slightly brackish (>5 ppt) to marine waters in the Netherlands. Finally all records have been used to assess how many new species for the Netherlands were recorded in six year periods since 1994.

Results & conclusions

In appendices I to IV all non-indigenous species are listed that have been recorded in the Netherlands and were probably aided in their distribution by humans.

In Appendix I for each of the species, the Phylum according to Bos *et al*. (2017), the Phylum according to WORMS (www.marinespecies.org), the common English name and the species status according to the Dutch species register (www.nederlandsesoorten.nl/) are noted.

Appendix II includes an indication of the vectors that were used by these species to enter North-West Europe and distribute themselves subsequently within North-West European waters. In addition the most probable vector is indicated with which the species reached the Netherlands.

Appendix III described where and when the species were first recorded in the Netherlands.

Appendix IV provides an overview of the waterbodies where the species were sighted. In addition it gives the expert opinion of the authors indicating whether these species have probably settled in these waterbodies. This was done taking their salinity preferences and the number of records into account.

Appendix IV gives the status codes for the occurrences of non-indigenous species in the Netherlands according to the Dutch species register (NSR, 2017).

In figure 2 the main transport vectors are illustrated for non-indigenous species that have probably settled in the Dutch North Sea. This excludes for example species that are known to prefer brackish waters and species that were recorded only once and probably haven't settled. For specimens of "brackish water species" that were recorded in the North Sea, it is assumed that they have not settled there and that they have probably washed out into the North Sea from a river. Concerning the main transport vectors of species settled in the Dutch North Sea, [1] ballast water, [2] hull fouling and [3] shellfish transports have been equally important where it concerns the vectors with which these species were originally introduced in North-West European waters (Fig. 2A).

After their introduction in North-West Europe, natural distribution has been responsible for the further spread throughout North-West Europe in about half of the cases. Hull fouling is responsible for about a third of the cases (Figs 2BC). These species can use harbours as stepping stones aiding in their distribution. As most species were introduced in the Netherlands by secondary spread, natural distribution and hull fouling have also been the main two vectors with which species, settled in the Dutch North Sea, have been introduced in the Netherlands. Focus-

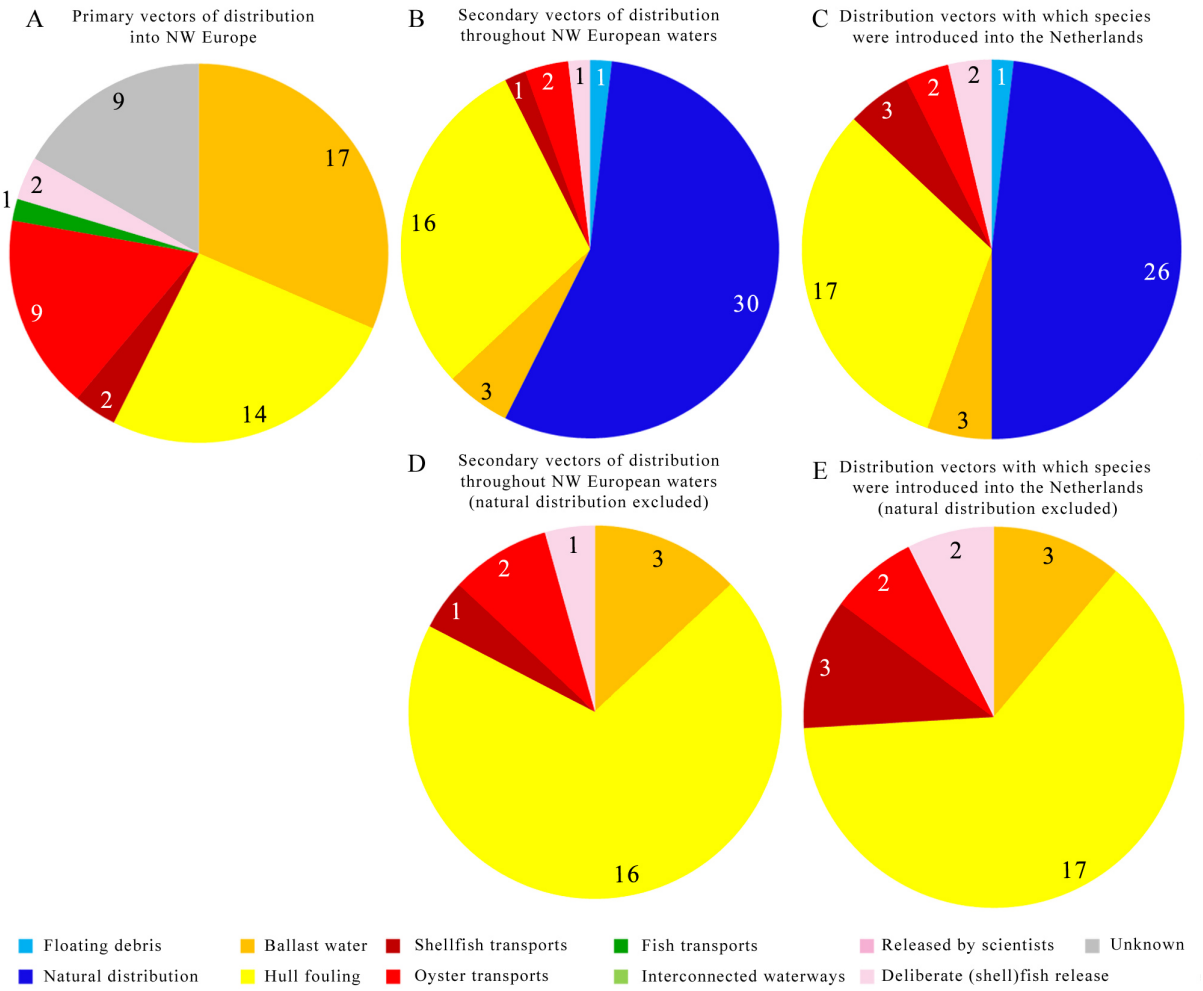

Fig. 2. Transport vectors of non-indigenous species that have probably settled in the Dutch North Sea (Appendix IV). Only species that have their native region outside of North-West Europe are included. [A] Primary vectors of distribution into North-West Europe; [B] Secondary vectors of distribution within North-West European waters; [C] Distribution vectors with which species were introduced into the Netherlands; [D] Excluding natural distribution, secondary vectors of distribution within North-West European waters; [E] Excluding natural distribution, distribution vectors with which species were introduced into the Netherlands.

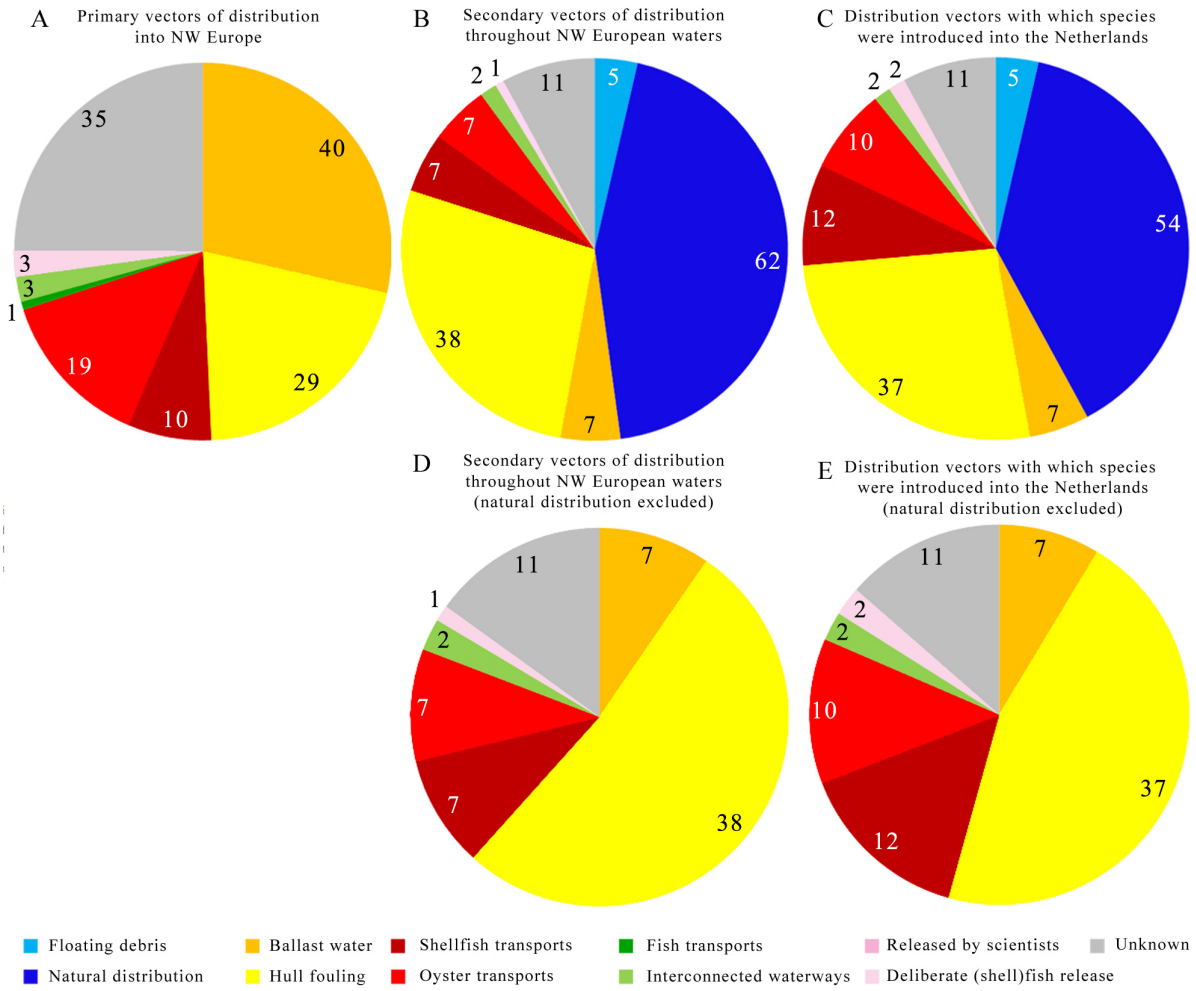

Fig. 3. Transport vectors of non-indigenous species that have probably settled in brackish to marine waters in the Netherlands (Appendix IV). Only species that have their native region outside of North-West Europe are included. [A] Primary vectors of distribution into North-West Europe; [B] Secondary vectors of distribution within North-West European waters; [C] Distribution vectors with which species were introduced into the Netherlands; [D] Excluding natural distribution, secondary vectors of distribution within North-West European waters; [E] Excluding natural distribution, distribution vectors with which species were introduced into the Netherlands.

ing only on anthropogenic vectors (Figs 2DE), hull fouling has been responsible for about two thirds of all introductions of these species, while ballast water and shellfish transports together account for most of the remaining third.

When, instead of focusing only on species settled in the North Sea, all non-indigenous species that have probably settled in slightly brackish to marine water bodies in the Netherlands, are considered (Fig. 3), ballast water imports and especially shellfish transports have been more important as secondary transport vectors throughout North-West Europe (Fig. 3D) and as introduction vectors into the Netherlands (Fig. 3E). This concerns mainly species that were introduced with Pacific oysters from the North-West Pacific in the late 20th century. These imports are nowadays prohibited. As primary vectors of introduction of these species into North-West European waters, the three vectors ballast water, hull fouling and shellfish transports have been equally important.

One of the main reasons that hull fouling is found to be the main vector of especially secondary spread, is probably because no specific EU legislation exists to minimize the risk of hull fouling as an non-indigenous species transport vector. There are various regulations in place to reduce this risk for ballast water and shellfish transports. These regulations may be partly responsible for the decrease in the number of new records of non-indigenous species in the Netherlands over the last six years (Figs. 4-5). This decrease can not be explained by a decrease in number of shipping movements. Marine traffic within Europe is steadily increasing over the years according to statistics of the EU (http://ec.europa.eu/eurostat, 2017). The decrease of the number of new records of non-indigenous species may however be partly due to an increase of new species recorded for the Netherlands in 2000-2011 caused by the fact that scuba-diving has become increasingly popular and underwater camera's relatively cheap. These scuba-divers and their photos have aided the discovery of a large number of non-indigenous species. Future studies may reveal to what degree this sudden improvement of monitoring effort by volunteer scuba-divers has influenced the number of new species recorded. From the present study it cannot be concluded to what degree the decrease of new records is linked to a varying monitoring effort and to what degree it is linked to a decrease of the number of new introductions into the Netherlands.

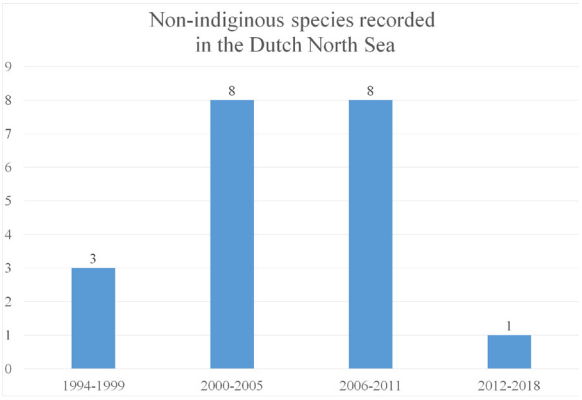

Fig. 4. The number of species that was recorded for the first time in the Netherlands. This graph only includes records of non-indigenous species that have been recorded in the Dutch North Sea and have their native region outside of North-West Europe (Appendices III-IV).

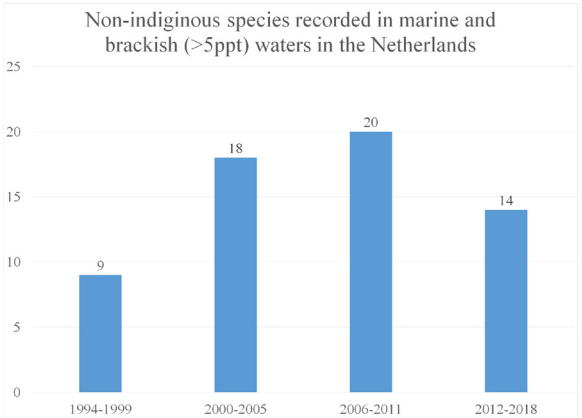

Fig. 5. The number of species that was recorded for the first time in the Netherlands. This graph only includes records of non-indigenous species that have their native region outside of North-West Europe, and have been recorded in brackish to marine waters in the Netherlands (Appendices III-IV).

Literature

1. **Bakker, C., 1972.** Milieu en plankton van het Veerse Meer, een tien jaar oud brakwatermeer in Zuidwest Nederland. Med. Hydrobiol. Ver. 6: 15-38.
2. **Baster, J., 1762.** Natuurkundige Uitspanningen, behelzende eenige waarnemingen over sommige zee-planten en zee-insecten, benevens derzelver zaadhuisjes en eijernesten. Eerste deel, tweede stukje. J. Bosch, Haarlem: 59-113.
3. **Borghouts-Biersteker, C.H., 1969.** *Balanus amphitrite amphitrite* Darwin in Nederland (Crustacea: Cirripedia). Zoöl. Bijdr., Leiden 11: 4-7.
4. **Bos, O.G., Gittenberger, A., De Boois, I.J., Van Asch, M., Van der Wal, J.T., Cremer, J., Van der Hoorn, B., Pieterse, S. & P.A.J. Bakker, 2017.** Soortenlijst Nederlandse Noordzee. Wageningen Marine Research, rapport C125/16A. Den Helder: Wageningen Marine Research.
5. **Boschma, H., 1948.** *Elminius modestus* in The Netherlands. Nature (Lond.) 161: 403-404.
6. **Buizer, D.A.G., 1983.** De Nederlandse zakpijpen (Manteldieren) en mantelvisjes. Tunicata, Ascidiacea en Appendicularia. Wet. Meded. Kon. Ned. Natuurhist. Ver. 158: 1-44.
7. **D'Hondt, J.-L. & G.C. Cadée, 1994.** *Bugula stolonifera* nieuw voor Nederland en enkele andere Bryozoën van Texel. Zeepaard 54: 33-37.
8. **De Blauwe, H. & M.A. Faasse, 2001.** Extension of the range of *Tricellaria inopinata* and *Bugula simplex* in the North-East Atlantic Ocean. (Bryozoa: Cheilostomatida). Ned. Faun. Meded. 14: 103-112.
9. **De Blauwe, H. 2017.** *Biflustra grandicella* (Canu & Bassler, 1929) een warmteminnend mosdiertje (Bryozoa, Cheilostomata), nieuw voor Nederland en Europa. De Strandvlo 37(1)
10. **De Blauwe, H., 2009.** Mosdiertjes van de Zuidelijke Bocht van de Noordzee. Determinatiewerk voor België en Nederland. Uitgave Vlaams Instituut voor de Zee, Oostende: 464pp.
11. **De Boer, T.W. & R.H. de Bruyne, 1983.** De amerikaanse zwaardschede *Ensis directus* (Conrad, 1845) in Nederland. Basteria 47: 154.
12. **De Bruyne, R.H., 1994.** Schelpen van de Nederlandse kust. Stichting Jeugdbondsuitgeverij, Utrecht, 2e druk, 165 pp.
13. **De Weerdt, W., 1983.** De geweispons en haar familieleden. Zeepaard 45: 38-48.
14. **Dekker, W., Daan N., Heessen H.J.L. & W. van der Heij, 2005**. De Knorrepos (*Micropogonias undulatus* (L.)), een nieuwe vissoort in Nederland; De Levende Natuur 106 (2): 66-67
15. **Den Hartog, C. & L.B. Holthuis, 1951.** De Noordamerikaanse "Blue Crab" in Nederland. De Levende Natuur 54 (7) 121-125
16. **d'Udekem d'Acoz, C., Faasse M., Dumoulin E. & H. de Blauwe, 2005.** Occurrence of the Asian shrimp *Palaemon macrodactylus* in the southern bight of the North sea, with a key to the *Palaemonidae* of north-western Europe (Crustacea: Decapoda: Caridae). Ned. Faunistische Meded, 22, 95-111
17. **Essink, K., 1987.** Een nieuwe wormensoort voor Nederland: *Marenzelleria viridis* (Verrill, 1873). Het Zeepaard 47(3):80-83
18. **Faasse, M. A. & R. Ates, 2003.** De Nederlandse polyclade platwormen (Platyhelminthes: Turbellaria: Polycladida): 2. De uit Amerika afkomstige *Euplana gracilis* (Girard, 1850). Het Zeepaard 63(2): 57-60,
19. **Faasse, M.A. & A. Giangrande, 2012.** Description of *Bispira polyomma* (Annelida: Sabellidae): a probable introduction to The Netherlands. Aquatic Invasions 7.
20. **Faasse, M. A. & M. Ligthart, 2007.** The American oyster drill, *Urosalpinx cinerea* (Say, 1822), introduced to The Netherlands – increased risks after ban on TBT? Aquatic Invasions 2 (4) 402-406

21. **Faasse, M.A. & M. Melchers, 2014.** The exotic jellyfish *Blackfordia virginica* introduced into the Netherlands. Nederlandse Faunistische Mededelingen 45: 103-109.
22. **Faasse, M.A. & J.M. Turbeville, 2015.** First record of the north-west Pacific nemertean *Cephalothrix simula* in northern Europe. Marine Biodiversity Records 8 (e17): 1-6.
23. **Faasse, M. A. & G. van Moorsel, 2000.** Nieuwe en minder bekende vlokreeftjes van sublitorale harde bodems in het Deltagebied (Crustacea: Amphipoda: Gammaridea). Ned. Faun. Meded. 11: 19-42.
24. **Faasse, M.A. & G. van Moorsel, 2003.** The North-American amphipods, *Melita nitida* Smith, 1873 and Incisocalliope aestuarius (Watling and Maurer, 1973) (Crustacea: Amphipoda: Gammaridea), introduced to the Western Scheldt estuary (The Netherlands). Aquatic Ecology 37: 13. doi:10.1023/A:1022120729031
25. **Faasse, M.A. & W. Vervoort, 2001.** Een nieuwe brakwaterpoliep, *Thieliana navis* (Millard, 1959), uit het gat van Ouwerkerk, het Goesse Meer en de Westkapelse kreek. Het Zeepaard 61: 181-190.
26. **Faasse, M.A., 1990.** De zeepok *Balanus balanus* (L., 1758) autochthoon aangetroffen. Zeepaard 50: 129-130.
27. **Faasse, M.A., 1996.** *Caprella macho* Platvoet e.a., 1995, een nieuwe spookkreeft. Zeepaard 56: 2-3.
28. **Faasse, M. A., 2004**. De Aziatische zakpijp *Perophora japonica* Oka, 1927 in Nederland
29. **Faasse, M. A., 2007.** De zeepissebed *Ianiropsis sp*. (Crustacea: Isopoda: Janiridae) geïntroduceerd in Nederland. - Het Zeepaard 67(4): 125-127
30. **Faasse, M. A., 2007b.** Het exotische mosdiertje *Bugula neritina* (Linnaeus, 1758) in Nederland. Het Zeepaard, 67(6): 190-192
31. **Faasse, M. A., 2011.** The exotic isopod *Synidotea* in The Netherlands and europe, a japanese or american invasion (pancrustacea: isopoda)?. Nederlandse Faunistische Mededelingen 36:103-106
32. **Faasse M.A., 2011b.** *Pileolaria berkeleyana*, a spirorbin polychaete worm introduced to the Netherlands (Polychaeta: Serpulidae: Spirorbinae) - Nederlandse Faunistische Mededelingen 36: 99-102.
33. **Faasse, M.A., 2013.** The North American ostracod *Eusarsiella zostericola* (Cushman, 1906) arrives in mainland Europe. BioInvasions Records 2.
34. **Faasse, M.A. 2013b.** Further dispersal of the sea-spider *Ammothea hilgendorfi* (Böhm, 1879) in the North Sea to The Netherlands. BioInvasions Records 2(4): 287-289.
35. **Faasse, M.A., 2013c.** Northward dispersal of the tanaid Zeuxo holdichi to the Netherlands (Crustacea: Tanaidae). NFM 39: 95-98.
36. **Faassse, M.A.,2014.** Introduction of *Ptilohyale littoralis* to The Netherlands. Marine Biodiversity Records, 7: 1-5."
37. **Faasse, M.A., 2014b.** The Pacific amphipod *Monocorophium uenoi* (Stephensen, 1932) introduced to The Netherlands (NE Atlantic). BioInvasions Records, 3(1), 29-33
38. **Faasse, M.A., 2016.** Dispersal of the invasive tubeworms *Desdemona ornata* and *Pseudopolydora paucibranchiata* to the Netherlands (Polychaeta: Sedentaria). Nederlandse Faunistische Medelingen 46: 49-56
39. **FUnknowne, H.C., 1922.** Hydroiden. In: H.C. Redeke - Flora en fauna der Zuiderzee. Monografie van een brakwatergebied. De Boer, Den Helder: 185-210.
40. **Gittenberger, A. & N. Schrieken, 2000.** The secret weapon of Julius Caesar, part 2, colonial ascidians in the Netherlands. Onderwatersport, bondsblad NOB, Vol. June: 12-13.
41. **Gittenberger, A., 2009.** Exoten in de Oosterschelde. GiMaRIS rapport 2009_08: 9 pp. i.o.v. Ministerie van Landbouw, Natuur en Voedselkwaliteit, Directie Visserij.

42. **Gittenberger, A., Rensing, M. & N. Schrieken, 2011.** Minimizing the risk of non-native, toxic algae introduced in the Netherlands by shellfish imports. GiMaRIS rapport 2011_20: 120 pp. i.o.v. Productschap VIS.
43. **Gittenberger, A., Rensing, M., Schrieken, N. & H. Stegenga, 2012.** Schelpdier Afhankelijke Soorten Inventarisatie: SASI Oosterschelde, zomer 2012. GiMaRIS rapport 2012_23: 53 pp. i.o.v. Producentenorganisatie van de Nederlandse Mosselcultuur.
44. **Gittenberger, A., Rensing, M., Niemantsverdriet, P., Schrieken, N., D'Hont, A. & H. Stegenga, 2015.** Soorteninventarisatie oesterputten en oesterpercelen, 2015. GiMaRIS rapport 2015_19: 23 pp. i.o.v. Bureau Risicobeoordeling & onderzoeksprogrammering, Nederlandse Voedsel- en Warenautoriteit, Ministerie van Economische Zaken
45. **Gittenberger, A., Rensing M., Dekker, R., Niemantsverdriet, P., Schrieken N. & H. Stegenga, 2015a.** Native and non-native species of the Dutch Wadden Sea in 2014GiMaRIS rapport 2015_08: 93 pp. i.o.v. Ministerie Economische Zaken; Bureau Risicobeoordeling en Onderzoeksprogrammering (BuRO).
46. **Gittenberger, A., Rensing, M., Niemantsverdriet, P., Gittenberger E. & H. Stegenga, 2015b.** Inventarisatie van de tarrastortplaatsen bij Yerseke, Strijenham en het Zijpe in de Oosterschelde. GiMaRIS rapport 2015_10: 23 pp. i.o.v. Ministerie Economische Zaken; Bureau Risicobeoordeling en Onderzoeksprogrammering (BuRO).
47. **Gittenberger, A., Rensing, M., Niemantsverdriet, P., Schrieken, N. & H. Stegenga, 2015c.** Soorten inventarisatie van de mosselpercelen in de Oosterschelde, zomer 2015. GiMaRIS rapport 2015_22: 37 pp. i.o.v. Producentenorganisatie van de Nederlandse Mosselcultuur.
48. **Hobbs, N. V., Lazo-Wasem, E., Faasse, M., Cordell, J. R., Chapman, J. W., Smith, C. S., ... & J.T. Carlton, 2015.** Going global: the introduction of the Asian isopod *Ianiropsis serricaudis* Gurjanova (Crustacea: Peracarida) to North America and Europe. Aquatic Invasions, 10(2), 177-187. doi:10.3391/ai.2015.10.2.06
49. **Hoek, P.P.C., 1879.** Carcinologisches. III. Eine Orchestide des Festlandes. T. Ned. Dierkundige Ver. 4: 130-134.
50. **Hofker, J., 1930.** Faunistische Beobachtungen in der Zuidersee während ihre Trockenlegung. Z. Morphol. Ökol. Tiere 18: 189-216.
51. **Holthuis, L.B. & G.R. Heerebout, 1972.** Vondsten van de zeepok *Balanus tintinnabulum* (L., 1758) in Ne-derland. Zoöl.Bijdr. Leiden 13: 24-31.
52. **Horst, R., 1919.** Polychaete Anneliden uit het Alkmaarder Meer. Zoöl. Meded., Leiden, 5: 110-111.
53. **Jha, A., Jetter, A., Lindley, J.A. Postel, L. & M. Wootton, 2013.** Extension of distribution of *Pseudodiaptomus marinus*, an introduced copepod, in the North Sea. Marine Biodiversity Records, 6. doi:10.1017/S1755267213000286
54. **Kaas, P. & A.N.C. ten Broek, 1944.** Nederlandse zeemollusken. Wereldbibliotheek, Amsterdam. 232 pp.
55. **Kamps, L.F., 1937.** De chineese wolhandkrab in Nederland. PhD thesis, University of Groningen. 112 pp.
56. **Kat, M., 1982.** *Pleurosigma planctonicum*, a rare diatom in the Dutch coastal area. J. mar. biol. Ass. U. K. 62: 233-234.
57. **Kerckhof, F. & M.A. Faasse, 2014.** *Boccardia proboscidea* and *Boccardiella hamata* (Polychaeta: Spionidae: Polydorinae), introduced mud worms new for the North Sea and Europe, respectively. Marine Biodiversity Records 7; e76; doi:10.1017/S1755267214000803

58. **Kerckhof, F. & A. Cattrijsse, 2001.** Exotic Cirripedia (Balanomorpha) from buoys off the Belgian coast. Senckenbergiana marit. 31: 243-254.
59. **Klink, A., J. Mulder, M. Wilhelm & M. Jansen 1997**. Biologische Monitoring Zoete Rijkswateren - Macrofauna in de Rijntakken 1995 en het Noordzeekanaal 1993. RIZA rapp. 13M95.22.
60. **Korringa, P., 1948.** *Anomia ephippium* L. Levende Natuur 51: 149.
61. **Korringa, P., 1951.** The shell of *Ostrea edulis* as a habitat. -Arch. Néerl. Zool., 10:32-152
62. **Leentvaar, P., 1960.** Een zeldzame kwal in de Rammekenshoek. Levende Natuur 63: 261-262.
63. **Ligthart, M., 2007.** Steekt *Corella eumyota* (Traustedt, 1882) (Chordata - Tunicata - Ascidiacea - Enterogona - Phlebobranchia - Corellidae - Corella) zijn hals uit in Nederland?. Het Zeepaard 67 (3) 85-89.
64. **Loebl, M., J.E.E. van Beusekom & C.J.M. Philippart 2013.** No microzooplankton grazing during a *Mediopyxis helysia* dominated diatom bloom. Journal of Sea Research 82: 80-85.
65. **Maggs, C.A. & H. Stegenga, 1999.** Red algal exotics on North Sea coasts. Helgoländer Meeresuntersuch. 52: 245-258.
66. **Maitland, R.T., 1874.** Naamlijst van Nederlandsche schaaldieren. T. Ned. Dierkundige Ver. 1: 228-269.
67. **Maitland, R.T., 1897.** *Dreissensia cochleata* in den Amstel. T. Ned. Dierkundige Ver. (2) 5: LXXXV
68. **Mineur, F., A. Le Roux, H. Stegenga, M. Verlaque & C.A. Maggs, 2012.** Four new exotic red seaweeds on European shores. Biological Invasions 14: 1635-1641.
69. **Macrozoöbenthosonderzoek MWTL in de Delta, 2011.** Monitor Taakgroep (NIOZ-MON) Monitor Taskforce Publication Series 2013 - 16 eindrapport Oktober 2013.
70. **https://www.naturetoday.com**
71. **Nienhuis, P.H., 1968.** The algal vegetation of a brackish inland water basin in The Netherlands. Acta Bot. Neerl. 17: 26-37.
72. **Nieweg, D.C., Post J.N.J.& R.J. Vink, 2005**. *Rapana venosa* (Gastropoda: Muricidae): a new invasive species in the North Sea. Deinsia 11: 169-174.
73. **Nijland, R. & J. Beekman, 2000.** *Hemigrapsus penicillatus* De Haan 1835 waargenomen in Nederland. Zeepaard 60: 169-171.
74. **Nederlands Soortenregister, NSR, 2017.** http://www.nederlandsesoorten.nl.
75. **Oorthuys, C.B., 1924.** *Crepidula fornicata* in ons land. Levende Natuur 28: 384.
76. **Pax, F., 1936.** Anthozoa. In: G. Grimpe & E. Wagler (eds.) - Die Tierwelt der Nord- und Ostsee. Bd. IIIe. Akad. Verlagsges., Becker & Erler, Leipzig. 317 pp.
77. **Peperzak, L., 1994.** Plaagalgen in de Noordzee. Rijkswaterstaat, Rijksinstituut voor Kust en Zee, Rapport DGW-93.053, 87 pp.
78. **Petersen, K.S., Rasmussen, K.L., Heinemeier, J. & N. Rud, 1992.** Clams before Columbus?. Nature 359: 679.
79. **Prud'homme van Reine, W.F., 1977**. Japans bessenwier aan onze kust. Zeepaard 37: 58-63.
80. **Redeke, H.C., 1912.** Rapport over onderzoekingen betreffende het voorkomen van de scheepsworm (*Teredo megotara* Hanl.) in Nederlandse zeevisschersvaartuigen. 's-Gravenhage, 47 blz.
81. **Redeke, H.C. 1922.** Flora en Fauna der Zuiderzee. Monografie van een brakwatergebied. Nederlandse Dierkundige vereeniging. De Boer Jr., Den Helder.
82. **Redeke, H.C., 1934.** On the occurrence of two pelagic copepods, *Acartia bifilosa* and *Acartia tonsa* in the brackish waters of The Netherlands. J. Conseil perm. Exploration Mer 9: 39-43.

83. Saraber, J.G.A.M., 1962. *Ostroumovia inkermanica* in The Netherlands. Beaufortia 9: 117-120.

84. Schlesch, H., 1932. Über die Einwanderung nordamerikanischer Meeresmollusken in Europa unter Berücksichtigung von Petricola pholadiformis Lam. und ihrer Verbreitung im dänischen Gebiet. Arch. Molluskenk. 64: 146-154.

85. Scholten, J., 1913. Eenige aantekeningen over de land- en zoetwatermolluskenfauna van Nederland. Bijdr. Dierkunde 21: 67-71.

86. Sluys, R., Faubel, A., Rajagopal, S. 2005. A new and alien species of "oyster leech" (Platyhelminthes, Polycladida, Stylochidae) from the brackish North Sea Canal, The Netherlands. Helgol Mar Res 59: 310. doi:10.1007/s10152-005-0006-3

87. Stegenga, H. & M. Karremans, 2012. *Trailliella intricata* (eindelijk) in Nederland aangetroffen. Het Zeepaard 72 (2) 47-49.

88. Stegenga, H. & B.G. Otten, 1997. Recente veranderingen in de Nederlandse zeewierflora III. Nieuwe vestigingen van soorten in de roodwiergenera *Choreocolax* (Choreocolaceae), *Grateloupia* (Cryptonemiaceae), *Ceramium* en *Seirospora* (Ceramiaceae). Gorteria 23: 69-76.

89. Stegenga, H. & W.F. Prud'homme van Reine, 1998. Changes in the seaweed flora of The Netherlands. In: G.W. Scott & J. Tittley (eds.) - Changes in the marine flora of the North Sea: 77- 87. CERCI, University College Scarborough, 168 pp.

90. Stegenga, H. & M. Vroman, 1976. The morphology and life history of *Acrochaetium densum* (Drew) Papenfuss (Rhodophyta, Nemaliales). Acta Bot. Neerl. 25: 257-280.

91. Stegenga, H., 1998. Nieuw gevestigde soorten van het geslacht *Polysiphonia* (Rhodophyta, Rhodomelaceae) in Zuidwest-Nederland. Gorteria 24: 149-156.

92. Stegenga, H., 1999. *Undaria pinnatifida* in Nederland gearriveerd. Zeepaard 59: 71-73.

93. Stegenga, H., 1999. Het roodwier *Agardhiella subulata* in Nederland. Zeepaard 59: 54-57.

94. Stegenga, H., 2003. *Dasya baillouviana*, vroeger en nu. Zeepaard 63: 131-135.

95. Stegenga, H., Rensing, M., Karremans, M., Mol, I. & A. Gittenberger, in prep. Atlas van de Nederlandse Zeewieren, deel1. Rhodophyta - Roodwieren.

96. Stock, J.H., 1950. Parasiet veroorzaakt massasterfte onder mossels. Zeepaard 10: 87-89.

97. Stock, J.H., 1950b. Strandvlooien. SWG-Tabellenserie 9: 1-8 (+ inlegvel).

98. Stock, J.H., 1952. Some notes on the taxonomy, the distribution and the ecology of four species of the amphipod genus *Corophium*. Beaufortia 2 (21): 1-10.

99. Stock, J.H., 1993b. Een tweede soort *Mytilicola* in Nederland. Zeepaard 53: 41-44.

100. Stock, J.H., 1995. Vindplaatsen van de ivoorpok, *Balanus eburneus*, in Nederland. Zeepaard 55: 19-22.

101. Stock, J.H., 1993. Copepoda (Crustacea) associated with commercial and non-commercial Bivalvia in the East Scheldt, The Netherlands. Bijdr. Dierkunde 63: 61-64.

102. Ten Hove, H.A., 1974. Notes on Hydroides elegans (Haswell, 1883) and *Mercierella enigmatica* Fauvel, 1923, alien serpulid polychaetes introduced into The Netherlands. Bull. Zoöl. Mus., Univ. Amsterdam 4: 43-51.

103. Tripos, 1993. Biomonitoring van fytoplankton in de Nederlandse zoute en brakke wateren 1992. Rijkswaterstaat Dienst Getijdewateren, Rapport 1992, 123 pp.

104. Tripos, 1995. Biomonitoring van fytoplankton in de Nederlandse zoute en brakke wateren, 1994. Geannoteerde soortenlijst. Bijlage 1 bij TRIPOS-Rapport 95003.1, 94 pp.

105. Van Banning, P., 1988. Management strategies to control diseases in the Dutch culture of edible oysters. Am. Fish. Soc., Spec. Publ. 18: 245-243.

106. Van Banning, P., Heermans, W., & Willigen, J.A. van, 1985. Anguillicola crassa, een nieuwe aalparasiet in de Nederlandse wateren. Visserij 38: 237-240.

107. van Beek, G. C. W., 2016. The round goby *Neogobius melanostomus* first recorded in the Netherlands. Aquatic Invasions 1

108. Van Benthem Jutting, T., 1945. Mollusca. C. Lamellibranchia. Fauna van Nederland 12: 1-477.

109. Van Bragt, P.H., 2003. Twee autochtone waarnemingen van de priktolhoren; *Calliostoma zizyphinum*, (Linnaeus 1758). http://www.anemoon.org/spuisluis/

110. Van Breemen, P.J., 1906. Bemerkungen über einige Planktonformen. Verh. Rijksinst. Onderz. Zee 1: 1-7.

111. Van Breemen, P.J., 1907. Verslag van een vergadering op 24-11-1906 in het Aquariumgebouw in Artis. T. Ned. Dierkundige Ver., 2e Ser. 10 (3): XLIV (pages numbered wrongly).

112. Van den Brink, F.W.B., G. van der Velde & A. bij de Vaate, 1989. A note on the immigration of *Corophium curvispinum* Sars, 1895 (Crustacea: Amphipoda) into The Netherlands via the river Rhine. Bull. Zoöl. Mus., Univ. Amsterdam 11: 211-214.

113. Van Goor, A.C.J., 1923. Die holländischen Meeresalgen. Verh. Kon. Akad. Wet., Amsterdam, (2) 23 (2): 1-232.

114. Van Haaren, T. & J. Soors, 2009. *Sinelobus stanfordi* (Richardson, 1901): A new crustacean invader in Europe. Aquatic Invasions (2009) Volume 4, Issue 4: 703-711

115. Van Koolwijk, Th., 1982. Calcareous sponges of The Netherlands. Bull. Zoöl. Mus., Univ. Amsterdam 8 (12): 91-98.

116. Van Moorsel, G., 2013. De eerste vondst van de zager *Alitta virens* (M. Sars, 1835) in Nederland en kolonisatie van de Noordzee. Het Zeepaard 73 (3) 89-95.

117. Van Moorsel, G.W.N.M., Tempelman D. & W. Lewis, 2010. De Oostzeegroenworm *Marenzelleria neglecta* in het Noordzeekanaal (Polychaeta: Spionidae). Nederlandse Faunistische Mededelingen 34: 43-54

118. Van Soest, R.W.M., 1977. Marine and freshwater sponges of The Netherlands. Zoöl. Meded., Leiden 50: 261-273.

119. Van Soest, R.W.M., Kluijver, M.J. de, Bragt, P.H. van, Faasse, M., Nijland, R., Beglinger, E.J., Weerdt W.H. de & N.J. de Voogd, 2007. Sponge invaders in Dutch coastal waters. J. Mar. Biol. Ass. U.K. 87: 1733-1748

120. Vervoort, W., 1964. *Gonionemus vertens* opnieuw in Nederland gevonden. Zeepaard 24: 57-60. [Rectificatie in Zeepaard 25: 4].

121. Waajen, S. & M. Faasse, 2011. *Haliclystus salpinx* Clark, 1863, een nieuw steelkwalletje in Nederland. Het Zeepaard 71 (2) 48-50

122. Waardenburg, H.G., 1827. Commentatio de Historia naturali Animalium Molluscorum Regno Belgico indigenorum. PhD Thesis, University of Leiden, 59 pp.

123. Werkgroep Exoten, een gecombineerde werkgroep van WEW en NecoV. www.werkgroepexoten.nl

124. Wijnhoven S. & A. Dekker, 2010. Records of a new alien polychaete worm species, *Marphysa sanguinea* (Montagu, 1815) (Eunicidae) in the Eastern Scheldt, the Netherlands. Aquatic Invasions 5: 451-456

125. Wijnhoven, S. & H. Hummel, 2009. Historische analyse exoten in de Zeeuwse delta. De opkomst, verspreiding, ontwikkeling en impact van exoten onder de macrofauna van het zachte substraat in de Zeeuwse brakke en zoute wateren. Monitor Taskforce Publication Series 2009 – 11.

126. Wijnhoven, S., Gittenberger, A., Faasse, M. & T. Schellekens, 2017. Overview alien species monitoring in the Western Scheldt: Current status of monitoring efforts and presence of alien species among macrofauna and algae. Ecoauthor Report Series 2017 - 01, 55pp.

127. Wittmann, K.J., Vanagt, T.J., Faasse, M.A. & J. Mees, 2012. A new transoceanic invasion? First records of Neomysis americana (Crustacea: Mysidae) in the

East Atlantic. The Open Marine Biology Journal 6: 62-66.

128. **Wolff, W.J., 1968.** Een nieuwe borstelworm in Nederland: *Mercierella enigmatica* Fauvel. Zeepaard 28: 56-58.
129. **Wolff, W.J., 1969.** Three species of Microphthalmus (Polychaeta) new to The Netherlands. Zoöl. Meded., Leiden, 45: 307-311.
130. **Wolff, W.J., 1974.** *Branchiomma bombyx* en *Fabricia sabella*, twee nieuwe polychaeten uit het Deltagebied. Zeepaard 34: 13-15.
131. **Wolff, W.j., 2005.** Non-indigenous marine and estuarine species in The Netherlands. Zool. Med. Leiden 79 (1)
132. **World Register of Marine Species WoRMS 2017.** http://www.marinespecies.org/ .
133. **www.anemoon.org**
134. **www.koemanbijkerk.nl**
135. **http://ec.europa.eu/eurostat/statistics-explained/index.php/Maritime_ports_freight_and_passenger_statistics#Further_Eurostat_information. Accessed on 14-11-2017.**

Appendix I

List of marine and brackish non-indigenous species that have been recorded in the Netherlands (i.e. species belonging to categories 2, 2a, 2b, 2c or 2d in Appendix V) and were probably aided in their distribution by humans. For each of the species, the Phylum according to WORMS (www.marinespecies.org) and according to Bos et al. (2017), common English name and species status according to the Dutch species register (www.nederlandsesoorten.nl; Appendix V) are noted.

Scientific name	Phylum accorind to WORMS	Phylum according to Bos *et al.*, 2017	Common English name	NSR status
Acrochaetium catenulatum	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Acrochaetium densum	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Agardhiella subulata	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Anotrichium furcellatum	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Antithamnionella spirographidis	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Antithamnionella ternifolia	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Bonnemaisonia hamifera	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2c
Colaconema dasyae	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Dasya baillouviana	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Dasya sessilis	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2c
Dasysiphonia japonica	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Gelidium vagum	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2c
Gracilaria vermiculophylla	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Grateloupia turuturu	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Lomentaria hakodatensis	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Neosiphonia harveyi	Rhodophyta	1.1 Roodwieren - Rhodophyta	Harvey's siphon weed	2b
Polysiphonia senticulosa	Rhodophyta	1.1 Roodwieren - Rhodophyta	-	2b
Codium fragile fragile	Chlorophyta	1.2 Groenwieren - Chlorophyta	dead man's finger	2a
Ulva australis	Chlorophyta	1.2 Groenwieren - Chlorophyta	-	2b
Bonamia ostreae	Cerzozoa	2.0 Chromoalveolata	-	2b
Haplosporidium armoricanum	Cerzozoa	2.0 Chromoalveolata	-	2d
Marteilia refringens	Cerzozoa	2.0 Chromoalveolata	-	2d
Colpomenia peregrina	Ochrophyta	2.1 Heterokontophyta	-	2b
Corynophlaea verruculiformis	Ochrophyta	2.1 Heterokontophyta	-	2b
Coscinodiscus wailesii	Ochrophyta	2.1 Heterokontophyta	-	2b
Fibrocapsa japonica	Ochrophyta	2.1 Heterokontophyta	-	2b
Heterosigma akashiwo	Ochrophyta	2.1 Heterokontophyta	-	2b
Mediopyxis helysia	Ochrophyta	2.1 Heterokontophyta	-	2c
Myriactula rivulariae	Ochrophyta	2.1 Heterokontophyta	-	2b
Odontella longicruris	Ochrophyta	2.1 Heterokontophyta	-	2c
Odontella sinensis	Ochrophyta	2.1 Heterokontophyta	-	2b
Pleurosigma simonsenii	Ochrophyta	2.1 Heterokontophyta	-	2b
Sargassum muticum	Ochrophyta	2.1 Heterokontophyta	wireweed	2b
Thalassiosira hendeyi	Ochrophyta	2.1 Heterokontophyta	-	2b
Thalassiosira nordenskioeldii	Ochrophyta	2.1 Heterokontophyta	-	2b
Thalassiosira punctigera	Ochrophyta	2.1 Heterokontophyta	-	2b
Undaria pinnatifida	Ochrophyta	2.1 Heterokontophyta	wakame	2b
Alexandrium leei	Myzozoa	2.2 Pantserwieren - Dinoflagellata	-	2b
Alexandrium tamarense	Myzozoa	2.2 Pantserwieren - Dinoflagellata	-	2b
Karenia mikimotoi	Myzozoa	2.2 Pantserwieren - Dinoflagellata	-	2b
Celtodoryx ciocalyptoides	Porifera	3.1 Sponzen - Porifera	-	2b
Chalinula loosanoffi	Porifera	3.1 Sponzen - Porifera	Loosanoff's haliclona	2a
Haliclona (Haliclona) simulans	Porifera	3.1 Sponzen - Porifera	-	2d
Haliclona (Haliclona) urceolus	Porifera	3.1 Sponzen - Porifera	-	2d
Haliclona (Reniera) cinerea	Porifera	3.1 Sponzen - Porifera	-	2d

Scientific name	Phylum accorind to WORMS	Phylum according to Bos *et al.*, 2017	Common English name	NSR status
Haliclona (Rhizoniera) rosea	Porifera	3.1 Sponzen - Porifera	-	2b
Haliclona (Soestella) xena	Porifera	3.1 Sponzen - Porifera	-	2b
Halisarca dujardinii	Porifera	3.1 Sponzen - Porifera	-	2d
Hymeniacidon perlevis	Porifera	3.1 Sponzen - Porifera	-	2b
Leucosolenia somesii	Porifera	3.1 Sponzen - Porifera	-	2b
Mycale (Carmia) micracanthoxea	Porifera	3.1 Sponzen - Porifera	encrusting sponge	2a
Suberites massa	Porifera	3.1 Sponzen - Porifera	-	2b
Sycon scaldiense	Porifera	3.1 Sponzen - Porifera	-	2b
Mnemiopsis leidyi	Ctenophora	3.2 Ribkwallen - Ctenophora	American comb jelly	2b
Blackfordia virginica	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	-	2c
Cordylophora caspia	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	freshwater hydroid	2a
Diadumene cincta	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	orange anemone	2a
Diadumene lineata	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	orange-striped green anemone	2a
Edwardsia claparedii	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	-	2a
Garveia franciscana	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	rope grass hydroid	2b
Gonionemus vertens	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	clinging jellyfish	2b
Haliclystus salpinx	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	stalked jellyfish	2c
Moerisia inkermanica	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	-	2d
Nemopsis bachei	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	clinging jellyfish	2a
Pachycordyle navis	Cnidaria	3.3 Holtedieren, neteldieren - Cnidaria	brackish hydroid	2b
Euplana gracilis	Platyhelminthes	3.5 Platwormen - Platyhelminthes	-	2d
Imogine necopinata	Platyhelminthes	3.5 Platwormen - Platyhelminthes	-	1a
Stylochus (Stylochus) flevensis	Platyhelminthes	3.5 Platwormen - Platyhelminthes	-	2d
Barentsia ramosa	Entoprocta	3.7 Kelkdiertjes, kelkwormen - Entoprocta	-	2d
Biflustra grandicella	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2d
Bugula neritina	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Bugulina simplex	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Bugulina stolonifera	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Fenestrulina delicia	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Pacificincola perforata	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Smittoidea prolifica	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Tricellaria inopinata	Bryozoa	3.9 Mosdiertjes - Bryozoa	-	2b
Cephalothrix simula	Nemertea	3.11 Snoerwormen - Nemertea	-	2c
Alitta virens	Annelida	3.12 Ringwormen - Annelida	king ragworm	2a
Bispira polyomma	Annelida	3.12 Ringwormen - Annelida	-	2c
Boccardia proboscidea	Annelida	3.12 Ringwormen - Annelida	-	2c
Boccardiella hamata	Annelida	3.12 Ringwormen - Annelida	-	2c
Boccardiella ligerica	Annelida	3.12 Ringwormen - Annelida	-	2b
Branchiomma bombyx	Annelida	3.12 Ringwormen - Annelida	-	2d
Desdemona ornata	Annelida	3.12 Ringwormen - Annelida	-	2c
Ficopomatus enigmaticus	Annelida	3.12 Ringwormen - Annelida	Australian tubeworm	2b
Hydroides elegans	Annelida	3.12 Ringwormen - Annelida	-	2d
Marenzelleria neglecta	Annelida	3.12 Ringwormen - Annelida	-	2b

Scientific name	Phylum accorind to WORMS	Phylum according to Bos *et al.*, 2017	Common English name	NSR status
Marenzelleria viridis	Annelida	3.12 Ringwormen - Annelida	-	2b
Marphysa sanguinea	Annelida	3.12 Ringwormen - Annelida	-	2b
Neodexiospira brasiliensis	Annelida	3.12 Ringwormen - Annelida	-	2b
Pileolaria berkeleyana	Annelida	3.12 Ringwormen - Annelida	-	2c
Polydora hoplura	Annelida	3.12 Ringwormen - Annelida	-	2b
Pseudopolydora paucibranchiata	Annelida	3.12 Ringwormen - Annelida	-	2c
Sabellaria spinulosa	Annelida	3.12 Ringwormen - Annelida	Ross worm	2d
Streblospio benedicti	Annelida	3.12 Ringwormen - Annelida	-	2b
Syllidia armata	Annelida	3.12 Ringwormen - Annelida	-	2d
Syllis gracilis	Annelida	3.12 Ringwormen - Annelida	-	2b
Anomia ephippium	Mollusca	3.13 Weekdieren - Mollusca	saddle oyster	2d
Calliostoma zizyphinum	Mollusca	3.13 Weekdieren - Mollusca	painted top shell	2b
Calyptraea chinensis	Mollusca	3.13 Weekdieren - Mollusca	Chinese hat	2d
Corambe obscura	Mollusca	3.13 Weekdieren - Mollusca	obscure corambe	2
Corbicula fluminea	Mollusca	3.13 Weekdieren - Mollusca	prosperity clam	2b
Crepidula fornicata	Mollusca	3.13 Weekdieren - Mollusca	American slipper limpet	2b
Ensis leei	Mollusca	3.13 Weekdieren - Mollusca	American jack knife clam	2b
Gibbula cineraria	Mollusca	3.13 Weekdieren - Mollusca	grey topshell	2b
Glycymeris glycymeris	Mollusca	3.13 Weekdieren - Mollusca	dog cockle	2d
Magallana gigas	Mollusca	3.13 Weekdieren - Mollusca	Pacific oyster	2b
Mercenaria mercenaria	Mollusca	3.13 Weekdieren - Mollusca	northern quahog	2b
Mya arenaria	Mollusca	3.13 Weekdieren - Mollusca	steamer clam	2a
Mytilopsis leucophaeata	Mollusca	3.13 Weekdieren - Mollusca	dark false mussel	2a
Ocenebra inornata	Mollusca	3.13 Weekdieren - Mollusca	Japenese oysterdrill	2b
Pecten maximus	Mollusca	3.13 Weekdieren - Mollusca	scallop	2d
Petricolaria pholadiformis	Mollusca	3.13 Weekdieren - Mollusca	false angelwing	2a
Phorcus lineatus	Mollusca	3.13 Weekdieren - Mollusca	toothed top shell	2d
Potamopyrgus antipodarum	Mollusca	3.13 Weekdieren - Mollusca	New-Zealand mudsnail	2a
Psiloteredo megotara	Mollusca	3.13 Weekdieren - Mollusca	big-ear shipworm	2a
Rangia cuneata	Mollusca	3.13 Weekdieren - Mollusca	wedge clam	2b
Rapana venosa	Mollusca	3.13 Weekdieren - Mollusca	veined whelk	2d
Ruditapes philippinarum	Mollusca	3.13 Weekdieren - Mollusca	Manila clam	2c
Teredo navalis	Mollusca	3.13 Weekdieren - Mollusca	naval shipworm	2a
Urosalpinx cinerea	Mollusca	3.13 Weekdieren - Mollusca	Atlantic oyster drill	2b
Anguillicoloides crassus	Nematoda	3.15 Nematoden - Nematoda	swim-bladder nematode	2b
Acartia (Acanthacartia) tonsa	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2a
Ammothea hilgendorfi	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Amphibalanus amphitrite	Arthropoda	3.17 Geleedpotigen - Arthropoda	striped barnacle	2b
Amphibalanus eburneus	Arthropoda	3.17 Geleedpotigen - Arthropoda	ivory barnacle	2d
Amphibalanus improvisus	Arthropoda	3.17 Geleedpotigen - Arthropoda	bay barnacle	2a
Ampithoe valida	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Austrominius modestus	Arthropoda	3.17 Geleedpotigen - Arthropoda	New-Zealand barnacle	2b
Balanus balanus	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2d
Callinectes sapidus	Arthropoda	3.17 Geleedpotigen - Arthropoda	American blue crab	2b
Caprella mutica	Arthropoda	3.17 Geleedpotigen - Arthropoda	Japanese skeleton shrimp	2b

Scientific name	Phylum accorind to WORMS	Phylum according to Bos *et al.*, 2017	Common English name	NSR status
Caprella scaura	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Chelicorophium curvispinum	Arthropoda	3.17 Geleedpotigen - Arthropoda	Caspian mud shrimp	2b
Cryptorchestia cavimana	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2a
Eriocheir sinensis	Arthropoda	3.17 Geleedpotigen - Arthropoda	Chinese mitten crab	2b
Eurytemora americana	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2
Eusarsiella zostericola	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Hemigrapsus sanguineus	Arthropoda	3.17 Geleedpotigen - Arthropoda	Asian shore crab	2b
Hemigrapsus takanoi	Arthropoda	3.17 Geleedpotigen - Arthropoda	brush-clawed shore crab	2b
Ianiropsis serricaudis	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2b
Incisocalliope aestuarius	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2b
Jassa marmorata	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2
Megabalanus coccopoma	Arthropoda	3.17 Geleedpotigen - Arthropoda	titan acorn barnacle	2d
Megabalanus tintinnabulum	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2d
Melita nitida	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2b
Monocorophium sextonae	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2b
Monocorophium uenoi	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Myicola ostreae	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2b
Mytilicola intestinalis	Arthropoda	3.17 Geleedpotigen - Arthropoda	red worm disease	2b
Mytilicola orientalis	Arthropoda	3.17 Geleedpotigen - Arthropoda	oyster redworm	2b
Neomysis americana	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Palaemon macrodactylus	Arthropoda	3.17 Geleedpotigen - Arthropoda	Oriental shrimp	2b
Platorchestia platensis	Arthropoda	3.17 Geleedpotigen - Arthropoda	beach flea	2b
Pseudodiaptomus marinus	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Ptilohyale littoralis	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Rhithropanopeus harrisii	Arthropoda	3.17 Geleedpotigen - Arthropoda	mud crab	2a
Sinelobus vanhaareni	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2b
Synidotea laticauda	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Telmatogeton japonicus	Arthropoda	3.17 Geleedpotigen - Arthropoda	marine splash midge	2b
Zeuxo holdichi	Arthropoda	3.17 Geleedpotigen - Arthropoda	-	2c
Aplidium glabrum	Chordata	3.20 Chordadieren - Chordata	-	2b
Botrylloides violaceus	Chordata	3.20 Chordadieren - Chordata	colonial sea squirt	2b
Corella eumyota	Chordata	3.20 Chordadieren - Chordata	-	2b
Didemnum vexillum	Chordata	3.20 Chordadieren - Chordata	compound sea squirt	2
Diplosoma listerianum	Chordata	3.20 Chordadieren - Chordata	-	2b
Gobiosoma bosc	Chordata	3.20 Chordadieren - Chordata	naked goby	2c
Micropogonias undulatus	Chordata	3.20 Chordadieren - Chordata	hardhead, golden croaker	2b
Molgula manhattensis	Chordata	3.20 Chordadieren - Chordata	sea grapes	2a
Neogobius melanostomus	Chordata	3.20 Chordadieren - Chordata	round goby	2b
Oncorhynchus mykiss	Chordata	3.20 Chordadieren - Chordata	rainbow trout	2d
Perophora japonica	Chordata	3.20 Chordadieren - Chordata	-	2b
Sebastes schlegelii	Chordata	3.20 Chordadieren - Chordata	-	2d
Styela clava	Chordata	3.20 Chordadieren - Chordata	rough sea squirt	2b
Tridentiger barbatus	Chordata	3.20 Chordadieren - Chordata	-	2d
Trinectes maculatus	Chordata	3.20 Chordadieren - Chordata	hogchoker	2d
Ostreid herpesvirus-1 µvar (OsHV-1 µvar)	n.a.	4.0 Virus	-	2c

Appendix II

List of marine and brackish non-indigenous species that have been recorded in the Netherlands (i.e. species belonging to categories 2, 2a, 2b, 2c or 2d in Appendix V) and were probably aided in their distribution by humans. Indications based on expert judgement are included of the most probable vectors that were used by these species to enter North-West Europe and distribute themselves subsequently within North-West European waters. In addition the most probable vector is indicated with which these species reached the Netherlands.

Scientific name	NW European species	Primary distribution vector to North-West Europe	Secondary distribution vector in North-West Europe	Most probably first reached the Netherlands by
1.1 RHODOPHYTA				
Acrochaetium catenulatum	No	Unknown	Unknown	Unknown
Acrochaetium densum	No	Unknown	Unknown	Unknown
Agardhiella subulata	No	Shellfish transports	Hull fouling	Shellfish transports
Anotrichium furcellatum	No	Shellfish transports	Shellfish transports	Shellfish transports
Antithamnionella spirographidis	No	Hull fouling	Hull fouling	Hull fouling
Antithamnionella ternifolia	No	Hull fouling	Hull fouling	Hull fouling
Bonnemaisonia hamifera	No	unknown	Hull fouling	Hull fouling
Colaconema dasyae	No	unknown	unknown	unknown
Dasya baillouviana	No	unknown	Natural distribution	Natural distribution
Dasya sessilis	No	Unknown	Natural distribution	Natural distribution
Dasysiphonia japonica	No	Shellfish transports	Shellfish transports	Shellfish transports
Gelidium vagum	No	Unknown	Natural distribution	Natural distribution
Gracilaria vermiculophylla	No	Unknown	Natural distribution	Natural distribution
Grateloupia turuturu	No	Shellfish transports	Hull fouling	Shellfish transports
Lomentaria hakodatensis	No	Unknown	Natural distribution	Natural distribution
Neosiphonia harveyi	No	unknown	Natural distribution	Natural distribution
Polysiphonia senticulosa	No	unknown	Natural distribution	Natural distribution
1.2CHLOROPHYTA				
Codium fragile fragile	No	Hull fouling	Hull fouling	Hull fouling
Ulva australis	No	unknown	Natural distribution	Natural distribution
2.0 CHROMOALVEOLATA				
Bonamia ostreae	No	Oyster transports	Oyster transports	Oyster transports
Haplosporidium armoricanum	No	Oyster transports	Oyster transports	Oyster transports
Marteilia refringens	No	Oyster transports	Oyster transports	Oyster transports
2.1 HETEROKONTOPHYTA				
Colpomenia peregrina	No	Oyster transports	Natural distribution	Natural distribution
Corynophlaea verruculiformis	No	unknown	Floating debris	Floating debris
Coscinodiscus wailesii	No	Ballast water	Natural distribution	Natural distribution
Fibrocapsa japonica	No	Ballast water	Natural distribution	Natural distribution
Heterosigma akashiwo	unknown	unknown	Natural distribution	Natural distribution
Mediopyxis helysia	no	Unknown	Natural distribution	Natural distribution
Myriactula rivulariae	unknown	unknown	Floating debris	Floating debris
Odontella longicruris	no	Ballast water	Natural distribution	Natural distribution
Odontella sinensis	No	ballast water	Natural distribution	Natural distribution
Pleurosigma simonsenii	No	unknown	Natural distribution	Natural distribution
Sargassum muticum	No	Oyster transports	Natural distribution	Natural distribution
Thalassiosira hendeyi	no	Ballast water	Natural distribution	Natural distribution
Thalassiosira nordenskioeldii	no	Ballast water	Natural distribution	Natural distribution
Thalassiosira punctigera	no	Oyster transports	Natural distribution	Natural distribution
Undaria pinnatifida	No	Oyster transports	Natural distribution	Natural distribution
2.2 DINOFLAGELLATA				
Alexandrium leei	No	Ballast water	Natural distribution	Natural distribution
Alexandrium tamarense	unknown	Ballast water	Natural distribution	Natural distribution
Karenia mikimotoi	Unknown	Ballast water	Natural distribution	Natural distribution

Scientific name	NW European species	Primary distribution vector to North-West Europe	Secondary distribution vector in North-West Europe	Most probably first reached the Netherlands by
3.1 PORIFERA				
Celtodoryx ciocalyptoides	No	Oyster transports	Natural distribution	Oyster transports
Chalinula loosanoffi	Yes	n.a.	unknown	unknown
Haliclona (Haliclona) simulans	Yes	n.a.	Natural distribution	Shellfish transports
Haliclona (Haliclona) urceolus	Yes	n.a.	Natural distribution	Shellfish transports
Haliclona (Reniera) cinerea	Yes	n.a.	Natural distribution	Shellfish transports
Haliclona (Rhizoniera) rosea	Yes	n.a.	unknown	unknown
Haliclona (Soestella) xena	Unknown	unknown	unknown	unknown
Halisarca dujardinii	Yes	n.a.	Natural distribution	Shellfish transports
Hymeniacidon perlevis	Yes	n.a.	Natural distribution	Shellfish transports
Leucosolenia somesii	Yes	n.a.	hull fouling	hull fouling
Mycale (Carmia) micracanthoxea	Yes	n.a.	Natural distribution	Shellfish transports
Suberites massa	Yes	n.a.	Natural distribution	Shellfish transports
Sycon scaldiense	unknown	Shellfish transports	Shellfish transports	Shellfish transports
3.2 CTENOPHORA				
Mnemiopsis leidyi	No	Ballast water	Natural distribution	Natural distribution
3..3 CNIDARIA				
Blackfordia virginica	No	Ballast water	Natural distribution	Natural distribution
Cordylophora caspia	No	Interconnected waterways	Natural distribution	Natural distribution
Diadumene cincta	Unknown	Unknown	Natural distribution	Natural distribution
Diadumene lineata	No	Oyster transports	Hull fouling	Hull fouling
Edwardsia claparedii	Unknown	Unknown	Natural distribution	Natural distribution
Garveia franciscana	Unknown	unknown	unknown	unknown
Gonionemus vertens	No	Oyster transports	Hull fouling	Hull fouling
Haliclystus salpinx	Yes	n.a.	Hull fouling	Hull fouling
Moerisia inkermanica	No	Hull fouling	Hull fouling	Hull fouling
Nemopsis bachei	No	hull fouling	Ballast water	Natural distribution
Pachycordyle navis	No	Ballast water	Natural distribution	Natural distribution
3.5 PLATYHELMINTHES				
Euplana gracilis	No	hull fouling	hull fouling	hull fouling
Imogine necopinata	Unknown	Ballast water	Natural distribution	Ballast water
Stylochus (Stylochus) flevensis	Unknown	unknown	unknown	unknown
3. ENTOPROCTA				
Barentsia ramosa	No	Ballast water	Hull fouling	Hull fouling
3.9 BRYOZOA				
Biflustra grandicella	No	Hull fouling	Hull fouling	Hull fouling
Bugula neritina	No	Hull fouling	Hull fouling	Hull fouling
Bugulina simplex	No	Hull fouling	Hull fouling	Hull fouling
Bugulina stolonifera	No	Hull fouling	Hull fouling	Hull fouling
Fenestrulina delicia	No	Shellfish transports	Floating debris	Shellfish transports
Pacificincola perforata	No	Shellfish transports	Natural distribution	Shellfish transports
Smittoidea prolifica	No	Shellfish transports	Natural distribution	Shellfish transports
Tricellaria inopinata	No	hull fouling	hull fouling	hull fouling
3.11 NEMERTEA				
Cephalothrix simula	No	Ballast water	Natural distribution	Natural distribution

Scientific name	NW European species	Primary distribution vector to North-West Europe	Secondary distribution vector in North-West Europe	Most probably first reached the Netherlands by
3.12 ANNELIDA				
Alitta virens	No	Unknown	Natural distribution	Natural distribution
Bispira polyomma	No	hull fouling	Hull fouling	Hull fouling
Boccardia proboscidea	No	Unknown	Natural distribution	Natural distribution
Boccardiella hamata	No	Unknown	Natural distribution	Natural distribution
Boccardiella ligerica	No	Unknown	Natural distribution	Natural distribution
Branchiomma bombyx	Yes	n.a.	unknown	unknown
Desdemona ornata	No	Ballast water	Natural distribution	Natural distribution
Ficopomatus enigmaticus	No	Ballast water	Hull fouling	Hull fouling
Hydroides elegans	Unknown	hull fouling	hull fouling	hull fouling
Marenzelleria neglecta	No	Ballast water	Unknown	Unknown
Marenzelleria viridis	No	Ballast water	Ballast water	Ballast water
Marphysa sanguinea	Yes	n.a.	Natural distribution	Natural distribution
Neodexiospira brasiliensis	No	unknown	Floating debris	Floating debris
Pileolaria berkeleyana	No	unknown	unknown	unknown
Polydora hoplura	Yes	n.a.	Oyster transports	Oyster transports
Pseudopolydora paucibranchiata	No	Unknown	Natural distribution	Natural distribution
Sabellaria spinulosa	Yes	n.a.	Oyster transports	Oyster transports
Streblospio benedicti	no	unknown	unknown	unknown
Syllidia armata	Yes	n.a.	Shellfish transports	Shellfish transports
Syllis gracilis	Yes	n.a.	Shellfish transports	Shellfish transports
3.13 MOLLUSCA				
Anomia ephippium	Yes	n.a.	Shellfish transports	Shellfish transports
Calliostoma zizyphinum	Yes	n.a.	Natural distribution	Shellfish transports
Calyptraea chinensis	Yes	n.a.	Shellfish transports	Shellfish transports
Corambe obscura	No	hull fouling	unknown	unknown
Corbicula fluminea	No	Ballast water	Ballast water	Ballast water
Crepidula fornicata	No	Oyster transports	Natural distribution	Floating debris
Ensis leei	No	Ballast water	Natural distribution	Natural distribution
Gibbula cineraria	Yes	n.a.	Shellfish transports	Shellfish transports
Glycymeris glycymeris	Yes	n.a.	Shellfish transports	Shellfish transports
Magallana gigas	No	Oyster transports	Natural distribution	Oyster transports
Mercenaria mercenaria	No	Deliberate	Shellfish transports	Shellfish transports
Mya arenaria	No	Ballast water	Natural distribution	Natural distribution
Mytilopsis leucophaeata	No	Hull fouling	Hull fouling	Hull fouling
Ocenebra inornata	No	Oyster transports	Oyster transports	Oyster transports
Pecten maximus	Yes	n.a.	Natural distribution	Shellfish transports
Petricolaria pholadiformis	No	Oyster transports	Oyster transports	Oyster transports
Phorcus lineatus	Yes	n.a.	Shellfish transports	Shellfish transports
Potamopyrgus antipodarum	No	Ballast water	Natural distribution	Natural distribution
Psiloteredo megotara	Unknown	hull fouling	hull fouling	hull fouling
Rangia cuneata	No	Ballast water	Ballast water	Ballast water
Rapana venosa	No	Ballast water	Natural distribution	Ballast water
Ruditapes philippinarum	No	Deliberate	Deliberate	Deliberate
Teredo navalis	No	Hull fouling	Hull fouling	Hull fouling
Urosalpinx cinerea	No	Oyster transports	Oyster transports	Oyster transports

Scientific name	NW European species	Primary distribution vector to North-West Europe	Secondary distribution vector in North-West Europe	Most probably first reached the Netherlands by
3.15 NEMATODA				
Anguillicoloides crassus	No	Fish transports	Natural distribution	Natural distribution
3.17 ARTHROPODA				
Acartia (Acanthacartia) tonsa	Unknown	ballast water	ballast water	ballast water
Ammothea hilgendorfi	No	Ballast water	Hull fouling	Hull fouling
Amphibalanus amphitrite	No	hull fouling	hull fouling	hull fouling
Amphibalanus eburneus	No	hull fouling	hull fouling	hull fouling
Amphibalanus improvisus	Unknown	Hull fouling	Hull fouling	Hull fouling
Ampithoe valida	No	Ballast water	Natural distribution	Natural distribution
Austrominius modestus	No	Hull fouling	Natural distribution	Natural distribution
Balanus balanus	No	Hull fouling	Natural distribution	Natural distribution
Callinectes sapidus	No	Ballast water	Ballast water	Ballast water
Caprella mutica	No	Hull fouling	Hull fouling	Hull fouling
Caprella scaura	No	Hull fouling	Hull fouling	Hull fouling
Chelicorophium curvispinum	No	Interconnected waterways	Interconnected waterways	Interconnected waterways
Cryptorchestia cavimana	No	Interconnected waterways	Interconnected waterways	Interconnected waterways
Eriocheir sinensis	No	Ballast water	Natural distribution	Natural distribution
Eurytemora americana	No	unknown	unknown	unknown
Eusarsiella zostericola	No	Oyster transports	Oyster transports	Oyster transports
Hemigrapsus sanguineus	No	Ballast water	Natural distribution	Natural distribution
Hemigrapsus takanoi	No	Ballast water	Natural distribution	Natural distribution
Ianiropsis serricaudis	No	Ballast water	Hull fouling	Hull fouling
Incisocalliope aestuarius	No	Ballast water	Hull fouling	Hull fouling
Jassa marmorata	No	Ballast water	Natural distribution	Natural distribution
Megabalanus coccopoma	No	hull fouling	Floating debris	Floating debris
Megabalanus tintinnabulum	No	Hull fouling	Natural distribution	Natural distribution
Melita nitida	No	Ballast water	Hull fouling	Hull fouling
Monocorophium sextonae	No	Hull fouling	Hull fouling	Hull fouling
Monocorophium uenoi	No	Unknown	Oyster transports	Oyster transports
Myicola ostreae	No	Oyster transports	Oyster transports	Oyster transports
Mytilicola intestinalis	No	Shellfish transports	Shellfish transports	Shellfish transports
Mytilicola orientalis	No	Shellfish transports	Shellfish transports	Shellfish transports
Neomysis americana	No	Ballast water	Ballast water	Ballast water
Palaemon macrodactylus	No	Ballast water	Natural distribution	Natural distribution
Platorchestia platensis	No	Unknown	unknown	unknown
Pseudodiaptomus marinus	No	Ballast water	Natural distribution	Natural distribution
Ptilohyale littoralis	No	hull fouling	Hull fouling	Hull fouling
Rhithropanopeus harrisii	No	Unknown	Hull fouling	Hull fouling
Sinelobus vanhaareni	No	hull fouling	Hull fouling	Hull fouling
Synidotea laticauda	No	Ballast water	Hull fouling	Hull fouling
Telmatogeton japonicus	No	unknown	Natural distribution	Natural distribution
Zeuxo holdichi	No	unknown	Shellfish transports	hull fouling

Scientific name	NW European species	Primary distribution vector to North-West Europe	Secondary distribution vector in North-West Europe	Most probably first reached the Netherlands by
3.20 CHORDATA				
Aplidium glabrum	Unknown	hull fouling	Natural distribution	Natural distribution
Botrylloides violaceus	No	hull fouling	hull fouling	hull fouling
Corella eumyota	No	Hull fouling	hull fouling	hull fouling
Didemnum vexillum	No	Oyster transports	Hull fouling	Hull fouling
Diplosoma listerianum	Yes	n.a.	Natural distribution	Natural distribution
Gobiosoma bosc	No	Ballast water	Ballast water	Ballast water
Micropogonias undulatus	no	Ballast water	Natural distribution	Natural distribution
Molgula manhattensis	No	Hull fouling	Hull fouling	Hull fouling
Neogobius melanostomus	No	Ballast water	Natural distribution	Natural distribution
Oncorhynchus mykiss	No	Deliberate	Natural distribution	Deliberate
Perophora japonica	No	Oyster transports	Natural distribution	Shellfish transports
Sebastes schlegelii	No	Deliberate	Natural distribution	Natural distribution
Styela clava	No	Oyster transports	Hull fouling	Hull fouling
Tridentiger barbatus	No	Ballast water	Natural distribution	Natural distribution
Trinectes maculatus	No	unknown	unknown	unknown
4.0 VIRUS				
Ostreid herpesvirus-1 µvar (OsHV-1 µvar)	No	Oyster transports	Natural distribution	Oyster transports

Appendix III

List of marine and brackish non-indigenous species that have been recorded in the Netherlands (i.e. species belonging to categories 2, 2a, 2b, 2c or 2d in Appendix V) and were probably aided in their distribution by humans.For each species it is described where and when they were first recorded in the Netherlands. The literature sources are indicated by the numbers used in the literature paragraph of this report.

Scientific name	First introduction in the Netherlands				
	Year	Date	Waterbody	Location	Source
1.1 RHODOPHYTA					
Acrochaetium catenulatum	1983	7-09-83	Grevelingen	Near Bruinisse	95
Acrochaetium densum	1967	7-12-67	Grevelingen	Near Bruinisse	90
Agardhiella subulata	1998	8-12-98	Oosterschelde	Yerseke, oysterponds	93
Anotrichium furcellatum	1950	5-08-50	Oosterschelde	Oyster ponds Yerseke	131
Antithamnionella spirographidis	1974	31-07-74	Oosterschelde	Near Yerseke	65
Antithamnionella ternifolia	1951	21-10-51	Oosterschelde	Near Yerseke	95
Bonnemaisonia hamifera	2011	-	Westerschelde	Yachtharbour Vlissingen	87
Colaconema dasyae	1951	25-10-51	Oosterschelde	Non-tidal brackish Gat van Ouwerkerk	71
Dasya baillouviana	1950	-	Oosterschelde	Near Yerseke	94
Dasya sessilis	2003	12-09-03	Oosterschelde	Gorishoek	95
Dasysiphonia japonica	1994	28-06-94	Oosterschelde	Oysterponds near Yerseke	89
Gelidium vagum	2010	21-01-10	Oosterschelde	Oysterponds near Yerseke	68
Gracilaria vermiculophylla	1994	28-03-94	Oostvoornse Meer	-	95
Grateloupia turuturu	1993	18-08-93	Oosterschelde	Oysterponds near Yerseke	88
Lomentaria hakodatensis	2004	20-08-04	North sea coast	Tidal pool in Neeltje Jans	95
Neosiphonia harveyi	1960	21-06-60	Canal through Zuid Beveland	-	91
Polysiphonia senticulosa	1993	4-05-03	Oosterschelde	Gorishoek Oosterschelde	89
1.2 CHLOROPHYTA					
Codium fragile fragile	1900	-	North Sea	Huisduinen	131
Ulva australis	1993	-	Dutch delta	-	131
2.0 CHROMOALVEOLATA					
Bonamia ostreae	1980	-	Oosterschelde	-	105
Haplosporidium armoricanum	1974	-	Oosterschelde	-	105
Marteilia refringens	1974	-	Oosterschelde	Yerseke bank	105
2.1 HETEROKONTOPHYTA					
Colpomenia peregrina	1921	1-05-21	Wadden Sea	Terschelling	113
Corynophlaea verruculiformis	1994	-	Grevelingen	Near Bruinisse	131
Coscinodiscus wailesii	1978	-	North Sea	-	104
Fibrocapsa japonica	<1991	-	North sea coast	-	131
Heterosigma akashiwo	1992	-	Wadden Sea	-	103
Mediopyxis helysia	2010	-	Wadden Sea	Between Den Helder and Den Oever	64
Myriactula rivulariae	1980	-	Grevelingen	-	89
Odontella longicruris	2009	-	Wadden Sea	-	134
Odontella sinensis	1905	-	North Sea	-	110
Pleurosigma simonsenii	1974	-	North Sea	-	56
Sargassum muticum	1977	-	North Sea	Renesse, Monster, Katwijk Den Helder and Texel	79
Thalassiosira hendeyi	<1995	-	Unknown	-	126
Thalassiosira nordenskioeldii	<1991	-	Unknown	-	126
Thalassiosira punctigera	1981	-	North sea coast	-	131
Undaria pinnatifida	1999	-	Oosterschelde	Oyster ponds	92
2.2 PANTSERWIEREN - DINOFLAGELLATA					
Alexandrium leei	1991	-	North Sea	-	104
Alexandrium tamarense	1989	-	North Sea	-	77
Karenia mikimotoi	1989	-	North Sea	-	131

Scientific name	First introduction in the Netherlands				
	Year	Date	Waterbody	Location	Source
3.1 PORIFERA					
Celtodoryx ciocalyptoides	2002	-	Oosterschelde	-	118
Chalinula loosanoffi	1880	-	Oosterschelde	-	131
Haliclona (Haliclona) simulans	2001	-	Oosterschelde	-	118
Haliclona (Haliclona) urceolus	1985	-	Oosterschelde	-	118
Haliclona (Reniera) cinerea	1951	-	Oosterschelde	-	118
Haliclona (Rhizoniera) rosea	1951	-	Oosterschelde	-	13
Haliclona (Soestella) xena	1977	-	Dutch delta	-	45
Halisarca dujardinii	2005	-	Oosterschelde	-	118
Hymeniacidon perlevis	1951	-	Dutch delta	-	119
Leucosolenia somesii	1996	-	Oosterschelde	-	45
Mycale (Carmia) micracanthoxea	1880	-	Oosterschelde	-	131
Suberites massa	1989	-	Oosterschelde	-	118
Sycon scaldiense	1975	-	Oosterschelde	-	115
3.2 CTENOPHORA					
Mnemiopsis leidyi	2006	-	Unknown	-	45
3.3 CNIDARIA					
Blackfordia virginica	2014	-	North Sea Canal	-	21
Cordylophora caspia	1884	-	Rotterdam waterworks	-	120
Diadumene cincta	1925	-	Wadden Sea	Schouwen and near Den Helder	76
Diadumene lineata	1912-13	-	Unknown	-	131
Edwardsia claparedii	<1917	-	Unknown	-	4
Garveia franciscana	1920	-	Dutch delta	-	39
Gonionemus vertens	1960	-	Dutch delta	Rammekenshoek Walcheren	62
Haliclystus salpinx	2010	6-06-10	Oosterschelde	-	121
Moerisia inkermanica	1959	23-09-59	North Sea Canal	North sea canal at IJmuiden	83
Nemopsis bachei	1905	-	Zuiderzee	-	111
Pachycordyle navis	1964	-	Oosterschelde	Gat van Ouwerkerk	25
3.5 PLATYHELMINTHES					
Euplana gracilis	2002	1-07-02	North Sea	Noorzeekanaal at ijmuiden	18
Imogine necopinata	1993	30-09-93	North Sea canal	Inlets of cooling water Velsen power station	86
Stylochus (Stylochus) flevensis	1921	-	Zuiderzee	-	50
3.7 KELKDIERTJES, KELKWORMEN - ENTOPROCTA					
Barentsia ramosa	2003	-	Nieuwe waterweg	-	126
3.9 BRYOZOA					
Biflustra grandicella	2016	11-12-16	Westerschelde	Vlissingen Kaloothaven	9
Bugula neritina	2007	-	Oosterschelde	-	45
Bugulina simplex	2000	-	Oosterschelde	Goesse Sas	8
Bugulina stolonifera	1993	-	Wadden Sea	NIOZ harbour at Texel	7
Fenestrulina delicia	2005	-	Oosterschelde	-	10
Pacificincola perforata	2005	-	Oosterschelde	-	10
Smittoidea prolifica	1995	26-10-95	Oosterschelde	Schelphoek	33
Tricellaria inopinata	2000	1-08-00	Dutch delta	Goesse Meer	10
3.11 NEMERTEA					
Cephalothrix simula		Nee			22

Scientific name	First introduction in the Netherlands				
	Year	Date	Waterbody	Location	Source
3.12 ANNELIDA					
Alitta virens	1903	19-02-03	Oosterschelde	Den Helder	116
Bispira polyomma	2010	18-09-10	Oosterschelde	Outlet oyserpond at Yerseke	19
Boccardia proboscidea	2013	5-07-13	Oosterschelde	Goesse Sas	57
Boccardiella hamata	2013	10-07-13	Westerschelde	Vlissingen	57
Boccardiella ligerica	1919	-	Alkmaarder meer	-	52
Branchiomma bombyx	1973	9-10-73	Canal through Walcheren	Keersluisbrug at Vlissingen	130
Desdemona ornata	2015	-	Oosterschelde	-	38
Ficopomatus enigmaticus	1967	summer ‘67	Westerschelde	Vlissingen (hull fouling)	128
Hydroides elegans	1973	1-09-73	Canal through Walcheren	Keersluisbrug at Vlissingen	102
Marenzelleria neglecta	2001	-	North Sea Canal	-	117
Marenzelleria viridis	1983	-	Eems estuary	Dollard	17
Marphysa sanguinea	1990	-	North sea coast	Hoek van Holland	124
Neodexiospira brasiliensis	<1986	-	Dutch delta	Canal at Goes	131
Pileolaria berkeleyana	2010	-	Oosterschelde	-	32
Polydora hoplura	1949	-	Dutch delta	-	61
Pseudopolydora paucibranchiata	2015	-	Oosterschelde	-	38
Sabellaria spinulosa	1938	13-12-38	Unknown	On dutch oysters	61
Streblospio benedicti	<2006	-	Unknown	-	131
Syllidia armata	1943	-	Oosterschelde	-	61
Syllis gracilis	1940	10-10-40	Oosterschelde	-	61
3.13 MOLLUSCA					
Anomia ephippium	1935		Oosterschelde	-	60
Calliostoma zizyphinum	2001	-	Oosterschelde	Sas van Goes	109
Calyptraea chinensis	<1942	-	Dutch delta	-	54
Corambe obscura	1879	-	Zuiderzee	Piers of Durgerdam	81
Corbicula fluminea	unknown	-	Unknown	-	40
Crepidula fornicata	1926	1-10-26	North sea	Zandvoort	75
Ensis leei	1981	-	Wadden Sea	Bocht van Watum	11
Gibbula cineraria	1980-90	-	Oosterschelde	Near Yerseke	12
Glycymeris glycymeris	unknown	-	Unknown	-	4
Magallana gigas	1928	-	Oosterschelde	-	131
Mercenaria mercenaria	1934	-	Oosterschelde	-	54
Mya arenaria	1250	-	Unknown	-	78
Mytilopsis leucophaeata	1895	-	The Amstel	Near Omval	67
Ocenebra inornata	2007	-	Oosterschelde	Yerseke	4
Pecten maximus	<1943	-	Oosterschelde	Oyster pond at Kattendijke	54
Petricolaria pholadiformis	1899	-	Belgium-Dutch Coast	-	84
Phorcus lineatus	<1985	-	Unknown	-	4
Potamopyrgus antipodarum	1913	-	North Sea Canal	Near Amsterdam, In a ditch	85
Psiloteredo megotara	<1913	-	North sea	Scheveningen	80
Rangia cuneata	2005	-	Unknown	-	45
Rapana venosa	2005	-	North Sea	Off Scheveningen	72
Ruditapes philippinarum	2008	-	Oosterschelde	-	41
Teredo navalis	1660	-	Unknown	-	108
Urosalpinx cinerea	2007	20-10-07	Oosterschelde	Gorishoek	20

Scientific name	First introduction in the Netherlands				
	Year	Date	Waterbody	Location	Source
3.15 NEMATODA					
Anguillicoloides crassus	1985	-	Unknown	-	105
3.17 ARTHROPODA					
Acartia (Acanthacartia) tonsa	1913-15	-	Zuiderzee	-	82
Ammothea hilgendorfi	2013	31-08-13	Oosterschelde	Zierikzee	34
Amphibalanus amphitrite	1962	-	Westerschelde	Vlissingen (in a cooling water discharge canal)	3
Amphibalanus eburneus	1890-99	-	Zuiderzee	The IJ inlet near amsterdam	100
Amphibalanus improvisus	<1827	-	inland waters and zuiderzee	inland waters and brackish parts of zuiderzee	122
Ampithoe valida	2013	13-9-2013	Westerschelde	Vlissingen	126
Austrominius modestus	1946	Autumn ‘46	North sea	Wassenaarse slag & Kijkduin	5
Balanus balanus	1990	-	Westerschelde	De Schone Waardin	26
Callinectes sapidus	1932	10-09-32	North Holland	The Zaan	15
Caprella mutica	1993	-	Oosterschelde	Entrance of the Eastern Scheldt	27
Caprella scaura	2016	-	Westerschelde	-	126
Chelicorophium curvispinum	1987	-	Rhine	Freshwater part of the Rhine	112
Cryptorchestia cavimana	1878	-	Waal	A garden at Zaltbommel, not close to the Waal River	49
Eriocheir sinensis	1931	-	Wadden Sea	Lauwerszee	55
Eurytemora americana	1963	-	Veerse Meer	-	1
Eusarsiella zostericola	2012	7-09-12	Oosterschelde	Zierikzee	33
Hemigrapsus sanguineus	1999	21-08-99	Oosterschelde	Schelphoek	131
Hemigrapsus takanoi	2000	19-03-00	Oosterschelde	Sas van Goes	73
Ianiropsis serricaudis	2000	17-08-00	North sea coast	Neeltje Jans	29
Incisocalliope aestuarius	1991	-	Westerschelde	Eastern part of Westernscheldt	23
Jassa marmorata	unknown	-	Unknown	-	45
Megabalanus coccopoma	1976-77	-	North Sea	on Bouys	58
Megabalanus tintinnabulum	1764	08-11-1764	North Sea	Wijk bij Zee	51
Melita nitida	1998	-	Westerschelde	Bath	23
Monocorophium sextonae	1952	11-05-52	North sea coast	At the inner side of the northern mole at IJmuiden	98
Monocorophium uenoi	2013	16-07-13	Oosterschelde	Yerseke tidal zone	37
Myicola ostreae	1992	Summer of 1992	Oosterschelde	-	99
Mytilicola intestinalis	1949	9-09-49	Oosterschelde	On mussels from Zandkreek	96
Mytilicola orientalis	1992	Summer ‘49	Oosterschelde	Oysterbed of Schelphoek	99
Neomysis americana	<2010	-	North Sea	Near Schiermonnikoog	127
Palaemon macrodactylus	1999	1-11-99	Westerschelde	-	16
Platorchestia platensis	<1950	-	Wadden Sea	Wieringen	97
Pseudodiaptomus marinus	2011	-	Westerschelde	-	53
Ptilohyale littoralis	2009	11-07-09	North sea coast	Rotterdam haven	36
Rhithropanopeus harrisii	<1874	-	Zuiderzee	-	66
Sinelobus vanhaareni	2006	14-09-06	Oude maas	-	114
Synidotea laticauda	2009	14-08-09	Westerschelde	Harbour of Walsoorden	31
Telmatogeton japonicus	1993	-	North Sea Canal	-	59
Zeuxo holdichi	2012	7-08-12	Oosterschelde	Zierikzee	35

Scientific name	First introduction in the Netherlands				
	Year	Date	Waterbody	Location	Source
3.20 CHORDATA					
Aplidium glabrum	1977	-	Oosterschelde	Yerseke	6
Botrylloides violaceus	2000	-	Westerschelde	Near Breskens	40
Corella eumyota	2007	-	Oosterschelde	Marina Burgsluis	63
Didemnum vexillum	1991	-	Oosterschelde	-	45
Diplosoma listerianum	1930	-	Oosterschelde	Southern coast of Schouwen Duiveland	6
Gobiosoma bosc	2017	13-03-17	North Sea Canal	Amsterdam	97
Micropogonias undulatus	2003	Oct-2003	Wadden Sea	-	14
Molgula manhattensis	1762	-	Unknown	On doors of sluices and locks in the Dijkwater at Island of Schouwen	2
Neogobius melanostomus	2004	1-12-04	Lek	Lek near Schoonhoven	107
Oncorhynchus mykiss	1898	-	Dutch delta	-	131
Perophora japonica	2004	15-07-04	North sea coast	Neeltje Jans Buitenhaven	28
Sebastes schlegelii	2008	11-04-08	Oosterschelde	-	41
Styela clava	1974	-	Unknown	-	131
Tridentiger barbatus	2016	31-05-16	Oosterschelde	Bergse diepsluis	97
Trinectes maculatus	1984	14-11-84	Wadden Sea	Javaruggen	131
4.0 VIRUS					
Ostreid herpesvirus-1 µvar (OsHV-1 µvar)	2010	-	Oosterschelde	-	45

Appendix IV

List of marine and brackish non-indigenous species that have been recorded in the Netherlands (i.e. species belonging to categories 2, 2a, 2b, 2c or 2d in Appendix V) and were probably aided in their distribution by humans. This appendix provides an overview of the waterbodies where the species were sighted. In addition it gives the expert opinion of the authors indicating whether these species have probably settled in these waterbodies. This was done taking their salinity preferences and the number of records into account. The literature sources are indicated by the numbers used in the literature paragraph of this report. Records of waterbodies where the species have probably settled are highlighted.

Scientific name	Marine (> 20 ppt)	Brackish (5-20 ppt)	North Sea	North Sea, Coastal zone	North Sea, offshore	Wadden Sea	Oosterschelde	Westerschelde	Grevelingen	Veerse Meer	Kanaal van Walcheren	Noordzeekanaal	Eems estuary
1.1 RHODOPHYTA													
Acrochaetium catenulatum	1	0					42		95				
Acrochaetium densum	1	0				45	41		131				
Agardhiella subulata	1	0					41		44				
Anotrichium furcellatum	1	0					41						
Antithamnionella spirographidis	1	0				45	41	126	4				
Antithamnionella ternifolia	1	0					41						
Bonnemaisonia hamifera	1	0					95	95					
Colaconema dasyae	1	1					41			131			
Dasya baillouviana	1	0					41		95				
Dasya sessilis	1	0				95	95		95				
Dasysiphonia japonica	1	0				45	41	126					
Gelidium vagum	1	0					95						
Gracilaria vermiculophylla	1	1				45	44						
Grateloupia turuturu	1	0					44						
Lomentaria hakodatensis	1	0	95	95			41						
Neosiphonia harveyi	1	0				45	41	126	44				
Polysiphonia senticulosa	1	0					41		44				
1.2 CHLOROPHYTA													
Codium fragile fragile	1	0	4	4		45	4	4	44				
Ulva australis	1	0				45	41	126	44				
2.0 CHROMOALVEOLATA													
Bonamia ostreae	1	1					105		105				
Haplosporidium armoricanum	1	0					105						
Marteilia refringens	1	0					105						
2.1 HETEROKONTOPHYTA													
Colpomenia peregrina	1	0				45	41		44				
Corynophlaea verruculiformis	1	0					41		4				
Coscinodiscus wailesii	1	0				45	41	126					
Fibrocapsa japonica	1	0	42	42		45	42	126	42				
Heterosigma akashiwo	1	0	42	42		45	42	126	42				
Mediopyxis helysia	1	1	64	64		64							
Myriactula rivulariae	1	0							131				
Odontella longicruris	1	0	134	134		134							
Odontella sinensis	1	0				45	41	126					
Pleurosigma simonsenii	1	0				45	41	126					
Sargassum muticum	1	0	4	4		45	41	126	44				
Thalassiosira hendeyi	1	0						126					
Thalassiosira nordenskioeldii	1	0						126					
Thalassiosira punctigera	1	0	131	131		131		126					
Undaria pinnatifida	1	0				45	41	126					
2.2 DINOFLAGELLATA													
Alexandrium leei	1	0	42		4								
Alexandrium tamarense	1	0	77			45	42		42				
Karenia mikimotoi	1	0	42	4	4								

Scientific name	Marine (> 20 ppt)	Brackish (5-20 ppt)	North Sea	North Sea, Coastal zone	North Sea, offshore	Wadden Sea	Oosterschelde	Westerschelde	Grevelingen	Veerse Meer	Kanaal van Walcheren	Noordzeekanaal	Ems estuary
3.1 PORIFERA													
Celtodoryx ciocalyptoides	1	1					118						
Chalinula loosanoffi	1	0					118		118				
Haliclona (Haliclona) simulans	1	0					118						
Haliclona (Haliclona) urceolus	1	0					118		118				
Haliclona (Reniera) cinerea	1	0					118						
Haliclona (Rhizoniera) rosea	1	0					118		118				
Haliclona (Soestella) xena	1	1				45	118	126	118				
Halisarca dujardinii	1	0					118						
Hymeniacidon perlevis	1	1	4		4	45	41						
Leucosolenia somesii	1	0				45	118						
Mycale (Carmia) micracanthoxea	1	1	4		4		41	126					
Suberites massa	1	0					45						
Sycon scaldiense	1	0					118	126					
3.2 CTENOPHORA													
Mnemiopsis leidyi	1	1				45	41	126					
3.3 CNIDARIA													
Blackfordia virginica	0	1						126				21	
Cordylophora caspia	0	1	4	4		45		4					
Diadumene cincta	1	0	4	4	4	45	41						
Diadumene lineata	1	1	4		4	45	41	126					
Edwardsia claparedii	1	0	4		4								
Garveia franciscana	0	1					41	126					
Gonionemus vertens	1	0	4		4	45	41		4				
Haliclystus salpinx	1	0					121						
Moerisia inkermanica	0	1	4	4								83	
Nemopsis bachei	0	1				45	41						
Pachycordyle navis	0	1				4	25			25	25		
3.5 PLATYHELMINTHES													
Euplana gracilis	0	1										18	
Imogine necopinata	0	1										86	
Stylochus (Stylochus) flevensis	0	1								50		50	
3.7 ENTOPROCTA													
Barentsia ramosa	0	1						126					
3.9 BRYOZOA													
Biflustra grandicella	1	0						10					
Bugula neritina	1	1	4	4	4		41						
Bugulina simplex	1	1	4		4		4		4				
Bugulina stolonifera	1	1	4		4	45	46	126	4				
Fenestrulina delicia	1	1	4	4	4		4						
Pacificincola perforata	1	1					41		44				
Smittoidea prolifica	1	1	4	4	4	45	41	126					
Tricellaria inopinata	1	1				45	41	126	4				
3.11 NEMERTEA													
Cephalothrix simula	1	0					22	126					

Scientific name	Marine (> 20 ppt)	Brackish (5-20 ppt)	North Sea	North Sea, Coastal zone	North Sea, offshore	Wadden Sea	Oosterschelde	Westerschelde	Grevelingen	Veerse Meer	Kanaal van Walcheren	Noordzeekanaal	Eems estuary
3.12 ANNELIDA													
Alitta virens	1	0	4	4	4	45	41	126					
Bispira polyomma	1	0					44						
Boccardia proboscidea	1	0					57	57					
Boccardiella hamata	1	0					57	57					
Boccardiella ligerica	0	1	4										
Branchiomma bombyx	1	0									130		
Desdemona ornata	1	0					38						
Ficopomatus enigmaticus	0	1	4		4	45	44	126		131		131	131
Hydroides elegans	1	1									102		
Marenzelleria neglecta	0	1										117	
Marenzelleria viridis	1	1	4	41				126					17
Marphysa sanguinea	1	0	124	124			124						
Neodexiospira brasiliensis	1	1				45	41	126					
Pileolaria berkeleyana	1	0					32	126					
Polydora hoplura	1	0					61						
Pseudopolydora paucibranchiata	1	0					38						
Sabellaria spinulosa	1	0	4	4	4		4	4					
Streblospio benedicti	1	0				45		126					
Syllidia armata	1	0					4	126					
Syllis gracilis	1	0	125	125			61	125	69				
3.13 MOLLUSCA													
Anomia ephippium	1	1	4		4		60						
Calliostoma zizyphinum	1	0					109						
Calyptraea chinensis	1	0					4						
Corambe obscura	0	1				45							
Corbicula fluminea	0	1	4										
Crepidula fornicata	1	0	4	4	4	45	41	126	44				
Ensis leei	1	1	4	4	4	45	41	126	4				
Gibbula cineraria	1	0	4	4	4		4						
Glycymeris glycymeris	1	0	4		4		45						
Magallana gigas	1	1	4	4	4	45	41	126	44				
Mercenaria mercenaria	1	1					41						
Mya arenaria	1	1	4	4	4	45	41	126	4				
Mytilopsis leucophaeata	0	1	4			45		126					
Ocenebra inornata	1	0					41		44				
Pecten maximus	1	0	4		4		4						
Petricolaria pholadiformis	1	0	4	4	4	45	41	4	4				
Phorcus lineatus	1	0					4						
Potamopyrgus antipodarum	0	0	4		4								
Psiloteredo megotara	1	0					41						
Rangia cuneata	0	1	4	4	4	45							
Rapana venosa	1	0	4		4								
Ruditapes philippinarum	1	0	4		4		41	126	4				
Teredo navalis	1	1	4	4	4	45	41	126					
Urosalpinx cinerea	1	0	4				41						

Scientific name	Marine (> 20 ppt)	Brackish (5-20 ppt)	North Sea	North Sea, Coastal zone	North Sea, offshore	Wadden Sea	Oosterschelde	Westerschelde	Grevelingen	Veerse Meer	Kanaal van Walcheren	Noordzeekanaal	Eems estuary
3.15 NEMATODA													
Anguillicoloides crassus	1	1	4	4	4	45	41	4	4				
3.17 ARTHROPODA													
Acartia (Acanthacartia) tonsa	1	1					4	126	131				
Ammothea hilgendorfi	1	0					44						
Amphibalanus amphitrite	1	0	41	41				126					
Amphibalanus eburneus	1	1										100	
Amphibalanus improvisus	1	1	4	4	4	45	41	126	4				
Ampithoe valida	1	0						126					
Austrominius modestus	1	1	4	4	4	45	41	126	44				
Balanus balanus	1	0	4		4		4	4					
Callinectes sapidus	1	1	4	4	4	45	41	123					
Caprella mutica	1	1	4	4		45	41	126					
Caprella scaura	1	0						126					
Chelicorophium curvispinum	0	1	4	4			4	4	4				
Cryptorchestia cavimana	0	1	4	4	4	4	4	4	4				
Eriocheir sinensis	1	1	41	41	4	45		126					
Eurytemora americana	1	1							131	131			
Eusarsiella zostericola	1	0					33						
Hemigrapsus sanguineus	1	1	4	4	4	45	41	126					
Hemigrapsus takanoi	1	1	4		4	45	41	126	44				
Ianiropsis serricaudis	1	0	4	4	4		44						
Incisocalliope aestuarius	0	1	4	4				126					
Jassa marmorata	1	0	4		4	45	43	126					
Megabalanus coccopoma	1	0					41						
Megabalanus tintinnabulum	1	0	4	4	4								
Melita nitida	1	1	4	4		45		126					
Monocorophium sextonae	1	1	4	131	4		41	23	23				
Monocorophium uenoi	1	0	4		4		4						
Myicola ostreae	1	0					99						
Mytilicola intestinalis	1	1				45	41	126					
Mytilicola orientalis	1	1					41						
Neomysis americana	1	1	127		4								
Palaemon macrodactylus	1	1				45	44	126					
Platorchestia platensis	1	1				45							
Pseudodiaptomus marinus	1	0	53		53			126					
Ptilohyale littoralis	1	0					36	126					
Rhithropanopeus harrisii	0	1	4		4	45							
Sinelobus vanhaareni	1	1										114	
Synidotea laticauda	0	1						31					
Telmatogeton japonicus	1	1	4	4		45		126				59	
Zeuxo holdichi	1	0	4	4	4	4	35	4					

Scientific name	Marine (> 20 ppt)	Brackish (5-20 ppt)	North Sea	North Sea, Coastal zone	North Sea, offshore	Wadden Sea	Oosterschelde	Westerschelde	Grevelingen	Veerse Meer	Kanaal van Walcheren	Noordzeekanaal	Eems estuary
3.20 CHORDATA													
Aplidium glabrum	1	1	4		4	45	44	126	44				
Botrylloides violaceus	1	1				45	41	126	44				
Corella eumyota	1	1					41						
Didemnum vexillum	1	0	4		4	45	41	126	44				
Diplosoma listerianum	1	1	4	4	4	45	44	4	44				
Gobiosoma bosc	1	1										70	
Micropogonias undulatus	1	1				14						14	
Molgula manhattensis	1	1	4	4	4	45	41	126	4				
Neogobius melanostomus	0	1	4	4		4						133	
Oncorhynchus mykiss	1	1	4	4			41		4				
Perophora japonica	1	1					41	126					
Sebastes schlegelii	1	0					41						
Styela clava	1	1	4	4		45	41	126	44				
Tridentiger barbatus	1	0						70					
Trinectes maculatus	1	0				45							
4.0 VIRUS													
Ostreid herpesvirus-1 µvar	1	0				45							
TOTALS													
Recorded	**154**	**79**	**79**	**50**	**52**	**73**	**127**	**83**	**51**	**5**	**3**	**13**	**2**
Probably established	**140**	**73**	**63**	**43**	**45**	**70**	**117**	**82**	**49**	**5**	**1**	**11**	**2**

Bijlage V

Status codes for the occurrences of non-indigenous species in the Netherlands according to the Dutch species register (NSR, 2017). N.B. For species with a relatively long lifespan, only the following status codes apply: 2a (at least 3 generations at 3 locations), 2c and 2d (NSR, 2017).

Status code NSR		**Description**
2	Alien species (undetermined)	Was introduced by humans. Exact status still has to be determined.
2a	Alien species (reproducing for at least 100 years)	Was introduced by humans. The species has maintained a self-sustaining population for at least 100 years after its introduction.
2b	Alien species (reproducing for 10-100 years)	Was introduced by humans. The species has maintained a self-sustaining population for 10 to 100 years after its introduction.
2c	Alien species (reproducing less than 10 years)	Was introduced by humans. The species has maintained a self-sustaining population less than 10 years after its introduction.
2d	Alien species: Incidental import (not reproducing)	Was introduced by humans. The species has not been able to reproduce after its introduction. These species are usually excluded on non-indigenous species lists.