A catworm (*Nephtys hombergii*)

MarLIN – Marine Life Information Network
Biology and Sensitivity Key Information Review

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The Marine Life Information Network, Marine Biological Association of the United Kingdom.

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See online review for distribution map

Distribution data supplied by the Ocean Biogeographic Information System (OBIS). To interrogate UK data visit the NBN Atlas.

Researched by	Georgina Budd & Joelene Hughes	**Refereed by**	This information is not refereed.
Authority	Savigny in Lamarck, 1818		
Other common names	-	**Synonyms**	-

Summary

Description

Nephtys hombergii is a relatively thin, smooth, segmented (90-200) worm up to 10-20 cm in length. Its head is small with four small antennae. It has a prominent, papillated proboscis which it uses to dig in to the sediment. Its body is rectangular when viewed in cross section but, may appear flattened (when viewed from above) owing to bristled lobes (parapods) that extend sidewards from the body. Typically it is a pearly white colour and chaetae (bristles on parapods) are golden. A long single tail-filament trails from its rear end. *Nephtys hombergii* is an active worm that demonstrates the characteristic swimming motion (a rapid lateral wriggling, starting from the rear and increasing in amplitude towards the head) of the Nephtyidae.

Recorded distribution in Britain and Ireland

Found throughout Britain and Ireland.

Global distribution

Found from the northern Atlantic, from such areas as the Barents Sea, the Baltic and the North

Sea, to the Mediterranean. *Nephtys hombergii* has been reported from as far south as South Africa.

Habitat

Nephtys hombergii lives infaunally in muddy sand in the intertidal and shallow sublittoral. It may also be found amongst gravel, rocks, and occasionally in *Zostera* beds.

Depth range

-

Identifying features

- Body with 90-200 segments; 10-20 cm in length and relatively thin.
- Smooth front and back, white in colour with a pearly iridescence.
- Body markedly rectangular in cross section.
- Head small, sometimes with small, visible eyes.
- No posterior chaetae (bristles) sharply bent.
- Branchial cirri shorter than gills.

Additional information

The different species of *Nephtys* are difficult to identify, requiring detailed examination of the parapodia and chaetae. Reference to Rainer (1991) is recommended.

Two other *Nephtys* species have previously been synonymous with *Nephtys hombergii*. *Nephtys assimilis* and *Nephtys kersivalensis* are now recognized as separate species as described in Rainer (1989) and Rainer (1991). Consequently, some records of the geographical distribution of *Nephtys hombergii* should be viewed with caution (Olive & Morgan, 1991).

Listed by

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Biology review

Taxonomy

Phylum	Annelida	Segmented worms e.g. ragworms, tubeworms, fanworms and spoon worms
Class	Polychaeta	Bristleworms, e.g. ragworms, scaleworms, paddleworms, fanworms, tubeworms and spoon worms
Order	Phyllodocida	
Family	Nephtyidae	
Genus	Nephtys	
Authority	Savigny in Lamarck, 1818	
Recent Synonyms	-	

Biology

Typical abundance	See additional information
Male size range	100-200mm
Male size at maturity	
Female size range	Medium(11-20 cm)
Female size at maturity	
Growth form	Vermiform segmented
Growth rate	
Body flexibility	High (greater than 45 degrees)
Mobility	
Characteristic feeding method	Non-feeding, Scavenger, Predator
Diet/food source	Planktotroph
Typically feeds on	Molluscs, crustaceans & other polychaetes.
Sociability	
Environmental position	Infaunal
Dependency	No information found.
Supports	No information
Is the species harmful?	No

Biology information

Abundance

Clay (1967f) lists densities of *Nephtys hombergii* reported by various authors from locations in the British Isles, which range from 570 per m in the Tamar Estuary to 2 per m at a location on the Northumbrian coast.

Mobility

Nephtys hombergii excavates no permanent burrow, but continually changes course in the sediment in the hunt for food, so that a maze of temporary burrows is made, marked only by a mucilage lining. These tunnels are located 5 to 15 cm beneath the surface (Linke, 1939; Holme, 1949). The sampling technique of Vader (1964) showed that the worm can move very quickly through the substratum, downwards on the ebb

tide and up again on the flood tide (Clay, 1967f). *Nephtys hombergii* is also capable of swimming short distances with an undulatory movement.

Nutrition

Adults of the species are carnivorous and captures prey with its eversible, papillated proboscis.

Habitat preferences

Physiographic preferences	Open coast, Estuary, Enclosed coast / Embayment
Biological zone preferences	Lower eulittoral, Mid eulittoral, Sublittoral fringe
Substratum / habitat preferences	Coarse clean sand, Fine clean sand, Muddy sand, Sandy mud
Tidal strength preferences	No information
Wave exposure preferences	Extremely sheltered, Moderately exposed, Sheltered, Very sheltered
Salinity preferences	Reduced (18-30 psu), Variable (18-40 psu)
Depth range	
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

Maximum densities of *Nephtys hombergii* tend to occur in the lower part of the intertidal that is also occupied by *Arenicola marina* (Clark & Haderlie, 1960; Clark *et al.*, 1962) but has been collected from dredge hauls at various depths. On some shores the intertidal zonation of *Nephtys hombergii* is probably determined by the type of substratum found at various levels (Clark & Haderlie, 1960). Although the species may colonize a variety of substrata, *Nephtys hombergii* may be found in higher densities in muddy environments and this tends to isolate it from *Nephtys cirrosa*, which is characteristic of cleaner, fairly coarse sand. High densities of *Nephtys hombergii* were found in substrata of 0.3% particles >0.25mm and 5.8% <0.125mm in diameter but the worm tolerated up to 3.8% 0.25mm and 2.2-15.9% <0.125mm (Clark *et al.*,1962).

Nephtys species penetrate into the mouths of estuaries and estuarine lagoons until the salinity falls below 20 psu, but *Nephtys hombergii* occasionally extends into waters with a salinity <18 psu (Barnes, 1994). Clark & Haderlie (1960) found *Nephtys hombergii* in the Bristol Channel at salinities between 15.9 psu and 25.1 psu.

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Annual protracted
Fecundity (number of eggs)	No information

Generation time	2-3 years
Age at maturity	2 years
Season	See additional information
Life span	2-5 years

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Lecithotrophic
Duration of larval stage	1-2 months
Larval dispersal potential	No information
Larval settlement period	Insufficient information

Life history information

Spawning

Sexes are separate. *Nephtys hombergii* remains in the sediment during spawning and eggs and sperm are released on to the surface of the sediment during low tide. Bentley (1989) gives an ultrastructural description of oogenesis in *Nephtys hombergii*. Mean size of oocytes was reported to be between 140 and 160 µm in Arcachon Bay, France, 200 µm in Southampton Water and between 100 to 140 µm on the Northumbrian coast (Mathivat-Lallier & Cazeau, 1991; Oyenenkan, 1986). The animals spawn via the anus. Histological examination by Bentley *et al.* (1984) revealed the development of a cleft in the central part of the gut in the prepygidial segment which serves to deliver the mature gametes to the anus for spawning. This system is developed only in mature worms of both sexes. Bentley *et al.* (1984) suggested that this represents the normal pathway for the discharge of gametes in the Nephtyidae, which lack functional coelomoducts. A spawning hormone (SH) released from the supraoesophageal ganglion brings about spawning in mature individuals (Olive, 1976; Olive & Bentley, 1980). *Nephtys hombergii* is a broadcast spawner, so it is advantageous that the spawning of a given individual coincides with that of several others of the same species. In addition to endocrine control, environmental factors, such as temperature, day-length, and tidal or lunar cycles, have been implicated in the timing of spawning of the Nephtyidae, in particular the spring tide phase of the lunar cycle (Bentley *et al.*, 1984).

Developmental mechanism

The planktonic cycle of *Nephtys hombergii* was described by Cazaux (1970), who defined five stages: two trochophore stages (2-3 days) and three metatrochophore stages. The first trochophore stage is lecithotrophic and successive four other stages are planktotrophic. The pelagic life cycle of *Nephtys hombergii* lasts seven to eight weeks at the end of which larvae metamorphose into benthic juveniles. Newly metamorphosed juveniles have an average width of 0.2 mm and eight or nine segments (Mathivat-Lallier & Cazaux, 1991).

Reproductive cycle

Observation of the reproductive patterns of the Nephtyidae suggest that they are related to environmental conditions in central parts of the range of each species, marginal populations of some species exhibit occasional reproductive failures, e.g. *Nephtys cirrosa*, whose reproductive physiology is not sufficiently well adapted to

conditions experienced in the northern limit of its range (Olive & Morgan, 1991). In the British Isles *Nephtys hombergii* has been observed to spawn in May and June in northern Britain, sometimes successfully but also unsuccessfully, to be followed by a period of oosorption (internal breakdown of gametes) overlapping with the subsequent cycle of gamete production. Olive & Morgan (1991) found reproductive failure in this species difficult to explain, as distribution records inferred *Nephtys hombergii* to be in the centre of its range in northeast England. They suggested for the relatively long-lived *Nephtys hombergii* that spawning failure could be part of an adaptive response in which adult survivorship is maintained at the expense of reproductive output (see Lewis *et al.*, 1962; Grémare & Olive, 1986). The endocrine system of *Nephtys hombergii* (see Bentley & Pacey, 1992) is able to control spawning by failing to secrete gonadotrophic hormone (GH), withdrawing GH secretion during the vitellogenic phase, or failing to secrete spawning hormone. Such endocrine responses may result from the receipt of inappropriate environmental signals from the soma (Bentley & Pacey, 1992). Olive *et al*. (1985) suggested that when energy levels of the soma fall below some critical level (which may reduce survival chances of the individual) then reproductive failure through GH withdrawal may result.
In the Tyne Estuary spawning of *Nephtys hombergii* occurred in May and September, whilst in Southampton Water the species spawned throughout the year with peaks in July and November (Wilson, 1936; Oyenekan, 1986). In Århus Bay, Denmark, *Nephtys hombergii* spawned in August and September, but a decrease in the number of individuals bearing gametes in May and June suggested that at least part of the population spawned in early summer (Fallesen & Jørgensen, 1991).

Sensitivity review

This MarLIN sensitivity assessment has been superseded by the MarESA approach to sensitivity assessment. MarLIN assessments used an approach that has now been modified to reflect the most recent conservation imperatives and terminology and are due to be updated by 2016/17.

Physical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Substratum Loss	Intermediate	Very high	Low	High

Nephtys hombergii lives infaunally so a considerable proportion of a population within an area would be removed with the sediment. However, the species is a rapid burrower and is able to swim using an undulatory movement, so some may escape the factor if the disturbance is detected in sufficient time. Intolerance has been assessed to be intermediate. Recoverability has been assessed to be very high as recolonization would occur via adult migration and larval settlement. Dittman *et al.* (1999) observed that *Nephtys hombergii* was amongst the macrofauna that colonized experimentally disturbed tidal flats within two weeks of the disturbance that caused defaunation of the sediment.

Smothering	Tolerant	Not relevant	Not sensitive	High

Nephtys hombergii is an active polychaete that uses its eversible proboscis to dig rapidly through the sediment. Vader (1964) observed that the worm relocates throughout the tidal cycle (see general adult biology). It is unlikely therefore, that *Nephtys hombergii* would be adversely affected by additional sediment of a texture consistent with that of the habitat. At the benchmark level an assessment of not sensitive has been made.

It is likely that viscous or impermeable materials would prevent the polychaete coming to the surface to seek food, but as it hunts infaunally and is mobile and therefore may be able to travel sufficient distance beneath impermeable materials in avoidance and therefore may survive for a period of one month.

Increase in suspended sediment	Tolerant	Not relevant	Not sensitive	Low

Nephtys hombergii lives infaunally and is a predatory species feeding on molluscs, crustaceans and other polychaetes. Increased suspended sediment would not interfere with its feeding. An assessment of not sensitive has been made.

Decrease in suspended sediment	Not relevant	Not relevant	Not relevant	High

Nephtys hombergii lives infaunally and is a predatory species feeding on molluscs, crustaceans and other polychaetes. Decreased suspended sediment would not interfere with its ability to feed. An assessment of not relevant has been made.

Dessication	Not relevant	Not relevant	Not relevant	High

The infaunal habit of *Nephtys hombergii* and its ability to burrow relatively rapidly through, and into the substratum are likely to aid the species in its avoidance of increased desiccation in the intertidal zone. Specimens at the uppermost of their distribution in the intertidal zone may become stressed by desiccation if the substratum begins to dry but *Nephtys hombergii* is sufficiently mobile to relocate to damper substrata. For instance, Vader (1964) observed that the worm

relocates throughout the tidal cycle (see general adult biology). An assessment of not relevant has been made.

Increase in emergence regime Not relevant Not relevant Not relevant Low

An increase in emergence regime is also likely to cause a decline in the abundance of polychaetes at the uppermost edge of their distribution in the intertidal zone, as they would experience drying of the substratum. *Nephtys hombergii* is sufficiently mobile to rapidly burrow and seek damper substrates. For instance, Vader (1964) observed that the worm relocates throughout the tidal cycle (see general adult biology). Consequently, an intolerance assessment of not relevant has been made as the species is protected from the factor by its habit.

Decrease in emergence regime Low Very high Very Low Low

When the substratum is immersed *Nephtys hombergii* comes to the surface to feed, but also hunts within the substratum at other times. A longer immersion time may mean that *Nephtys hombergii* spends longer at the surface where it would be prone to predation by demersal fish. However, as such hunting is part of the polychaetes normal behaviour, effects of a decrease in emergence are unlikely to have a significant effect on the populations viability and intolerance has been assessed to be low. Recoverability has been assessed to be very high as recolonization of the substratum would occur via adult migration and larval settlement. Dittman *et al.* (1999) observed that *Nephtys hombergii* was amongst the macrofauna that colonized experimentally disturbed tidal flats within two weeks of the disturbance that caused defaunation of the sediment.

Increase in water flow rate Low Very high Very Low Low

Nephtys hombergii lives within the sediment but may surface during periods of immersion to hunt on the surface where it would experience surface currents, but its size and growth form mean that it would not protrude above the substratum and therefore is unlikely to be swept away. Furthermore, if the polychaete finds conditions intolerable at the surface it may cease to emerge and only hunt infaunal prey. The locations where *Nephtys hombergii* is typically found have low rates of water flow, which favour the deposition of finer sediments. Increased water flow over a period of one year may cause erosion of the finer fractions of the sediment. Although *Nephtys hombergii* may inhabit a variety of substrata, it is reported to occur in highest densities in muddier sediments (see adult distribution) and consequently other species of Nephtyidae e.g. *Nephtys cirrosa*, that favour coarser cleaner sands may become dominant in the habitat. *Nephtys hombergii* may suffer reduced viability as a result of changes in its habitat and competition. Intolerance has been assessed to be low. Recoverability has been assessed to be very high as recolonization of the substratum would occur via adult migration and larval settlement. Dittman *et al.* (1999) observed that *Nephtys hombergii* was amongst the macrofauna that colonized experimentally disturbed tidal flats within two weeks of the disturbance that caused defaunation of the sediment.

Decrease in water flow rate Tolerant Not relevant Not sensitive Low

Nephtys hombergii may be found in and amongst a variety of substrata, but has been recorded in higher abundance in muddy sands in locations with relatively low water flow. As a consequence of decreased water flow, over a period of one year, the habitat in which *Nephtys hombergii* lives is likely to accumulate

additional sediment but would probably remain within the habitat preferences of the species. It is also unlikely that the behaviour of the polychaete would change. An assessment of tolerant has been made.

Increase in temperature Tolerant Not relevant Not sensitive High

By virtue of its burrowing habit and of its preference for the sublittoral and lower part of the littoral, *Nephtys hombergii* seems able to withstand extremes of temperature (Clay, 1967f). The species is found to the south of the British Isles (Mediterranean and Atlantic coasts in the southern hemisphere), so is likely to tolerate a long-term increase of 2°C. Emery & Stevensen (1957) found that the polychaete could withstand summer temperatures of 30-35°C so may also be able to tolerate a short-term acute increase in temperature. In addition, the species environmental position and mobility probably protects it from the factor. Therefore, an assessment of tolerant has been recorded.

Decrease in temperature Tolerant Not relevant Not sensitive High

Nephtys hombergii by virtue of its burrowing habit and of its preference for the sublittoral and lower part of the littoral seems able to withstand extremes of temperature (Clay, 1967f). The species is found to the north of the British Isles so is apparently tolerant of average temperatures lower than those it experiences in the British Isles. Raymont (1955) commented that *Nephtys hombergii* did not appear to suffer on the Argyleshire coast during the severe winter of 1946, as the polychaetes habitat was at low water level and beneath the sediment, it was unaffected by the intertidal freezing. Crisp (1964) also found no evidence that the polychaete was affected by the severe winter of 1962-63 on the north Wales coast. In addition, the species environmental position and mobility probably protects it from the factor. Therefore, an assessment of tolerant has been recorded.

Increase in turbidity Not relevant Not relevant Not relevant Not relevant

Nephtys hombergii lives infaunally between a depth of 5 and 15 cm where light is not transmitted. An increase in turbidity is unlikely to have a detectable effect on the viability of the species and an assessment of not relevant has been made.

Decrease in turbidity Not relevant Not relevant Not relevant Not relevant

Nephtys hombergii lives infaunally between a depth of 5 and 15 cm where light is not transmitted. A decrease in turbidity is unlikely to have a detectable effect on the viability of the species and an assessment of not relevant has been made.

Increase in wave exposure Intermediate Very high Low Moderate

Nephtys hombergii lives infaunally but may sometimes partially emerge to seek and capture food but does not present a significant surface area to wave action to sustain physical damage. Clark & Haderlie (1960) and Clark, Alder & McIntyre (1962) suggested that strong wave action limited the distribution of *Nephtys hombergii*. Increased wave action for the duration of one year may begin to change the nature of the substratum that the polychaete inhabits and its distribution may consequently alter. Therefore, an intolerance of intermediate has been recorded. On return to prior conditions recoverability may be very high as recolonization of the substratum would occur via adult migration as well as larval settlement. For instance, Dittman *et al.* (1999) observed that *Nephtys hombergii* was amongst the macrofauna that colonized experimentally disturbed tidal flats within two weeks of the disturbance that caused defaunation of the

sediment.

Decrease in wave exposure Tolerant Not relevant Not sensitive

Clark & Haderlie (1960) and Clark, Alder & McIntyre (1962) suggested that strong wave action limited the distribution of *Nephtys hombergii*, so it may be inferred that decreased wave exposure would not be detrimental to the species so an intolerance assessment of tolerant has been suggested.

Noise Tolerant Not relevant Not sensitive Low

Nephtys hombergii would probably detect vibration caused by noise, but noise at the benchmark level is unlikely to have a detectable effect on the viability of the species and an assessment of tolerant has been suggested.

Visual Presence Tolerant Not relevant Not sensitive Moderate

Nephtyidae possess primitive photoreceptors (Clark, 1956) and are unlikely to have the acuity to visually detect objects moving about on the surface of the overlying water. An assessment of not sensitive has been suggested.

Abrasion & physical disturbance Intermediate Very high Low Low

Nephtys hombergii lives in sediment between a depth of 5-15 cm and is therefore protected from most sources of abrasion and physical disturbance caused by surface action. However, it is likely to be damaged by any activity (e.g. anchors, or scallop dredging) that penetrates the sediment. Although the species is relatively mobile within the sediment intolerance has been assessed to be intermediate, as some individuals would probably be damaged. Recovery has been assessed to be very high, as re-population would occur initially relatively rapidly via adult migration and later by larval recruitment.

Displacement Tolerant Immediate Not sensitive High

If displaced *Nephtys hombergii* would be able to bury itself back into the substratum using its eversible proboscis (see general adult biology). It has been assessed to be not sensitive to displacement.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Intermediate	High	Low	Low

No evidence concerning the specific effects of chemical contaminants on *Nephtys hombergii* was found. Boon *et al.* (1985) reported that *Nephtys* species in the North Sea accumulated organochlorines but, based on total sediment analyses, organochlorine concentrations in *Nephtys* species were not correlated with the concentrations in the (type of) sediment which they inhabited. Specific effects of synthetic chemicals have been reported for other species of polychaete. Exposure of *Hediste diversicolor* and *Arenicola marina* to Ivermecten resulted in significant mortality (see *MarLIN* reviews; Collier & Pinn, 1998). Beaumont *et al.* (1989) investigated the effects of tri-butyl tin (TBT) on benthic organisms. At concentrations of 1-3 µg/l there was no significant effect on the abundance of *Hediste diversicolor* or *Cirratulus cirratus* after 9 weeks in a microcosm. However, no juvenile polychaetes were retrieved from the substratum suggesting that TBT had an effect on the larval and/or juvenile stages of these polychaetes. Bryan & Gibbs (1991) reported that *Arenicola costata* larvae were unaffected by 168 hr exposure to 2000 ng TBT/ l seawater and were probably relatively tolerant,

however in another study, *Scoloplos armiger* exhibited a dose related decline in numbers when exposed to TBT paint particles in the sediment. Intolerance has been assessed to be intermediate owing to the fact that different chemicals are likely to have different modes of action and effect on different species of polychaete. *Nephtys hombergii* may demonstrate similar sensitivities as the species mentioned above but little evidence was found. Recoverability has been assessed to be high as recolonization is likely via adult migration and larval settlement.

Heavy metal contamination Intermediate High Low Moderate

Nephtys hombergii is recorded in Restronguet Creek, a branch of the Fal Estuary system which is heavily contaminated with metals. Concentrations of dissolved Zn typically range from 100-2000 µ g/l, Cu from 10-100 µg/l and Cd from 0.25-5.0 µg/l. The sediments of Restronguet Creek are also highly contaminated, the levels of Cu, Zn, As and Sn being in the order of 1500-3500 µg/g (Bryan & Gibbs, 1983). Analyses of organisms from Restronguet Creek revealed that some species contained abnormally high concentrations of heavy metals. *Nephtys hombergii* from the middle and lower reaches of the creek contained appreciably higher concentrations of Cu (2227 µg/g dry wt), Fe and Zn than comparable specimens of *Hediste diversicolor* (as *Nereis diversicolor*). However, amongst polychaetes within the creek, there was evidence that some metals were regulated. In *Nephtys hombergii* the head end of the worm became blackened and x-ray microanalysis by Bryan & Gibbs (1983) indicated that this was caused by the deposition of copper sulphide in the body wall. In the same study, Bryan & Gibbs (1983) presented evidence that *Nephtys hombergii* from Restronguet Creek possessed increased tolerance to copper contamination. Specimens from the Tamar Estuary had a 96 h LC_{50} of 250 µg/l, whilst those from Restronguet Creek had a 96 h LC_{50} of 700 µg/l (35 psu; 13°C). Bryan & Gibbs (1983) suggested that since the area had been heavily contaminated with metals for > 200 years, there had been adequate time for metal-resistant populations to develop especially for relatively mobile species. An intolerance assessment of intermediate has been suggested as it is likely that given time populations of the species may become tolerant of heavy metal pollution, but that in the short term acute exposure of heavy metals may be deleterious to populations not previously exposed. Recoverability has been assessed to be high as recolonization is likely via adult migration and larval settlement.

Hydrocarbon contamination High High Moderate Moderate

The 1969 West Falmouth Spill of Grade 2 diesel fuel, documented by Sanders (1978), illustrates the effects of hydrocarbons in a sheltered habitat with a soft mud/sand substrata (Suchanek, 1993). The entire benthic fauna was eradicated immediately following the spill and remobilization of oil that continued for a period >1 year after the spill contributed to much greater impact upon the habitat than that caused by the initial spill. Effects are likely to be prolonged as hydrocarbons incorporated within the sediment by bioturbation will remain for a long time owing to slow degradation under anoxic conditions. Oil covering the surface and within the sediment would prevent oxygen transport to the infauna and promote anoxia as the infauna utilise oxygen during respiration. Although *Nephtys hombergii* is relatively tolerant of hypoxia and periods of anoxia (see oxygenation), a prolonged absence of oxygen would probably result in the death

of it and other infauna. McLusky (1982) found that petrochemical effluents, including organic solvents and ammonium salts, released from a point source to an estuarine intertidal mudflat of the Forth Estuary, Scotland, caused severe pollution in the immediate vicinity. Beyond 500 m distance the effluent contributed to an enrichment of the fauna in terms of abundance and biomass similar to that reported by Pearson & Rosenberg (1978) for organic pollution; *Nephtys hombergii* was found in the area with maximum abundance of species and highest total biomass at 500 m from the discharge. Intolerance has been assessed to be high as it seems likely that significant hydrocarbon contamination would kill affected populations of the species. On return to prior conditions recoverability has been assessed to be high as recolonization is likely via adult migration and larval settlement.

Radionuclide contamination Not relevant Not relevant

Insufficient information.

Changes in nutrient levels Low Very high Very Low Moderate

Nephtys hombergii is unlikely to be directly affected by nutrient enrichment as growth is not dependent on nutrient availability. However, symptoms of eutrophication (when nutrient input may exceeds the assimilative capacity of the environment) include hypoxia, to which *Nephtys hombergii* may be intolerant over long episodes (see oxygenation below) but has been found tolerant of over short episodes. At the benchmark level an intolerance assessment of low has been suggested as in the long term species viability may be affected. Effects of deoxygenation are considered separately. Recoverability has been assessed to be very high. Dittman *et al.* (1999) observed that *Nephtys hombergii* was amongst the macrofauna that colonized experimentally disturbed tidal flats within two weeks of the disturbance that caused defaunation of the sediment.

Increase in salinity Low Very high Very Low Moderate

Nephtys hombergii is considered to be a brackish water species (Barnes, 1994) but where the species occurs in open coastal locations the species would have to tolerate salinities of 25 psu and above. Within a few months of the closure of a dam across the Krammer-Volkerak estuary in the Netherlands, Wolff (1971) observed that species with pelagic larvae or a free-swimming phase, expanded rapidly with a concomitant increase of salinity to 9-15 psu everywhere. Prior to the closure of the dam the estuary demonstrated characteristics of a typical 'salt-wedge' estuary with a salinity gradient from 0.3 to 15 psu. Hence, *Nephtys hombergii* is likely to survive increases in salinity within estuarine environments and intolerance has been assessed to be low. In fully saline locations *Nephtys hombergii* may still be found but, may be competitively inferior to other species of Nephtyidae (e.g. *Nephtys ciliata* and *Nephtys hystricis*) and occur in lower densities. On return to optimal conditions recoverability is likely to be very high as recolonization via adult migration is likely to be rapid.

Decrease in salinity Low Very high Very Low Moderate

Nephtys hombergii is considered to be a brackish water species, and has been reported to extend in to estuarine locations where salinity is less than 18 psu (Barnes, 1994). Clark & Haderlie (1960) found *Nephtys hombergii* in the Bristol Channel at salinities between 15.9 psu and 25.1 psu. If the salinity were to become intolerable to the polychaete it is likely that as a mobile species, able to

both swim and burrow, *Nephtys hombergii* would avoid the change in salinity by moving away and localized densities would decline. The species is unlikely to be killed by the decrease in salinity and intolerance has been assessed to be low. Recoverability has been assessed to be very high as recolonization would occur via adult migration and larval recruitment within the year.

Changes in oxygenation	Tolerant	Not relevant	Not sensitive	High

Nephtys hombergii is a free-living, burrowing predator in marine sediments in which it has to survive periods of severe hypoxia and sulphide exposure, while at the same time maintaining agility in order to feed on other invertebrates. *Nephtys hombergii* has adapted to such conditions by utilising several strategies. Arndt & Schiedek (1997) found *Nephtys hombergii* to have a remarkably high content of phosphagen (phosphoglycocyamine), which is the primary energy source during periods of environmental stress. With increasing hypoxia, energy is also provided via anaerobic glycolysis, with strombine as the main end-product. Energy production via the succinate pathway becomes important only under severe hypoxia, suggesting a biphasic response to low oxygen conditions which probably is related to the polychaete's mode of life. The presence of sulphide resulted in a higher anaerobic energy flux and a more pronounced energy production via glycolysis than in anoxia alone. Nevertheless, after sulphide exposure under anaerobic conditions of <24 h, Arndt & Schiedek (1997) observed *Nephtys hombergii* to recover completely. Although *Nephtys hombergii* appears to be well adapted to a habitat with short-term fluctuations in oxygen and appearance of hydrogen sulphide, its high energy demand as a predator renders it likely to limit its survival in an environment with longer lasting anoxia and concomitant sulphide exposure. For instance, Fallesen & Jørgensen (1991) recorded *Nephtys hombergii* in localities in Århus Bay, Denmark, where oxygen concentrations were permanently or regularly low, but in the late summer of 1982 a severe oxygen deficiency killed populations of *Nephtys* species (*Nephtys hombergii* and *Nephtys ciliata*) in the lower part of the bay. However, *Nephtys hombergii* recolonized the affected area by the end of autumn the same year. Alheit (1978) reported a LC_{50} at 8°C of 23 days for *Nephtys hombergii* maintained under anaerobic conditions. Such evidence suggests that *Nephtys hombergii* would be tolerant of short episodes of oxygen deficiency and at the benchmark duration of one week *Nephtys hombergii* is unlikely to be adversely affected by hypoxic conditions and would revive on return to oxygenated sediment. At the benchmark level an assessment of not sensitive has been suggested.

Biological Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of microbial pathogens/parasites		Not relevant		Not relevant

Insufficient information

Introduction of non-native species	Tolerant	Not relevant	Not sensitive	Not relevant

No alien species are currently known to affect the viability of this species.

Extraction of this species	Intermediate	Very high	Low	Low

Nephtys hombergii is known as a 'catworm' amongst anglers who may dig sediments on a relatively small scale to obtain the species for fishing bait.

Intolerance has been assessed to be intermediate as a proportion of the population would be removed. Recovery of *Nephtys hombergii* has been assessed to be very high as re-population would occur initially relatively rapidly via adult migration and later by larval recruitment.

Extraction of other species High Very high Low High

Commercially exploitable species such as *Cerastoderma edule* occur in the same habitat as *Nephtys* species. Shellfish of marketable size can be harvested both in the intertidal and subtidal more rapidly and efficiently using mechanical methods such as tractor-powered harvesters and suction dredgers than by traditional methods. Hydraulic suction dredgers operate by fluidising the sand using water jets and then lifting the sediment and infauna into a revolving drum for sorting. The tractor-towed dredge utilises a blade between 70 -100 cm wide that penetrates to a depth of between 20-40 cm. Sediment is sorted through a rotating drum cage (Hall & Harding, 1997). Such machinery adversely impacts on non-target infaunal species as they are sucked or displaced from the sediment and sustain damage as 'by-catch'. For instance, Ferns *et al.* (2000) recorded significant losses of common infaunal polychaetes from areas of intertidal muddy sand sediment worked with a tractor-towed cockle harvester: 31 % of the polychaete *Scoloplos armiger* (initial density of 120 m) and 83 % of *Pygospio elegans* (initial density 1850 m) were removed and bird feeding activity increased on harvested areas as gulls and waders took advantage of invertebrates made available. Intolerance of *Nephtys hombergii* has been assessed to be high as mortalities would occur. In the study by Ferns *et al.* (2000) the population of *Pygospio elegans* remained depleted for more than 100 days after harvesting, whilst those of *Nephtys hombergii*, *Scoloplos armiger* and *Bathyporeia* spp. were depleted for over 50 days. Recovery of *Nephtys hombergii* has been assessed to be very high as re-population would occur initially relatively rapidly via adult migration and later by larval recruitment.

Additional information

None entered

Importance review

Policy/legislation

- no data -

Status

National (GB) importance	-	**Global red list (IUCN) category**	-

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

Large specimens of the Nephtyidae family are called 'catworms' and used as bait by fishermen.

A negative relationship between the abundance of the predatory polychaete *Nephtys hombergii* and values of biomass and rate of increase in two of its prey species, the polychaetes *Scoloplos armiger* and *Heteromastus filiformis*, were found by Beukema (1987) in long-term data from tidal flats in the western-most part of the Wadden Sea. Beukema (1987) observed that values for prey biomass tended to decline at high *Nephtys hombergii* biomass, whereas they tended to increase at lower levels of *Nephtys hombergii* biomass. Beukema (1987) considered these results to corroborate that *Nephtys hombergii* is an important infaunal predator in the Wadden Sea. Schubert & Reise (1986) also reported similar evidence and concluded *Nephtys hombergii* to be an important intermediate predator in the Wadden Sea.

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