



MarLIN

Marine Information Network

Information on the species and habitats around the coasts and sea of the British Isles

An opossum shrimp (*Neomysis integer*)

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

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2008-04-24

A report from:

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

Please note. This MarESA report is a dated version of the online review. Please refer to the website for the most up-to-date version [<https://www.marlin.ac.uk/species/detail/1691>]. All terms and the MarESA methodology are outlined on the website (<https://www.marlin.ac.uk>)

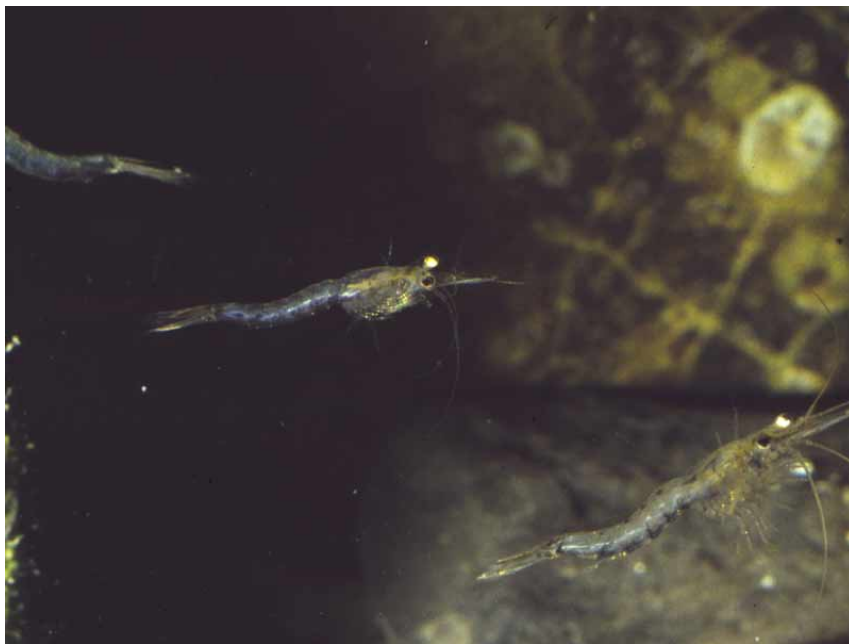
This review can be cited as:

Budd, G.C. 2008. *Neomysis integer* An opossum shrimp. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. DOI <https://dx.doi.org/10.17031/marlin.sp.1691.2>



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Neomysis integer.
 Photographer: Marco Faasse
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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

Refereed by

This information is not
 refereed.

Authority (Leach, 1814)

**Other common
 names** -

Synonyms

-

Summary

Description

A slender, free-swimming, shrimp that grows up to 17 mm in length. Its body is almost transparent, with occasional brown pigmentation. The species has a well developed carapace, which protects the large stalked eyes, head and thorax. The rostrum of the head is distinctly pointed but short. Its antennae are conspicuous and biramous (having an inner and outer extension), the outer extension (exopod) of the second pair of antennae, takes the form of a flattened plate, known as the antennal scale. The antennal scale is bordered along its margin with setae and is an important diagnostic characteristic. Thoracic limbs are well developed and also biramous, the outer set have a distinctly feathery appearance. Abdominal limbs are less developed and finger-like, with the exception of the last pair which are biramous and flattened, and form the tail fan (uropods).

Recorded distribution in Britain and Ireland

Records indicate *Neomysis integer* to have a widespread, but patchy distribution on all British and Irish coasts in locations of lowered salinity, usually estuaries or brackish water enclosures.

Global distribution

Distributed from Arctic Norway to the Atlantic coast of Spain.

Habitat

Neomysis integer is the dominant mysid shrimp in the upper reaches of estuaries. It is also found in non-tidal lagoons, isolated bodies of nearly freshwater, and in high shore hypersaline pools, but is rare in fully marine habitats.

↓ Depth range

5 - 10 m

Q Identifying features

- Body almost transparent; up to 17 mm in length.
- Large eyes on stalks.
- Well developed carapace with distinctly pointed but short rostrum.
- Two pairs of conspicuous antennae, both biramous.
- First pair of antennae are long. Outer limb of second antenna, forms antennal scale, which is very long and narrow, tapering to a point.
- Thoracic appendages all biramous, the outer limbs (exopods) are fringed (appear feather like).
- Abdominal appendages (pleopods) also biramous. Male pleopods are small, the 4th pair are elongated with a terminal pair of barbed setae.
- The telson (tail blade) is long, triangular in outline with narrow truncated tip; short spines around margin.

🏛️ Additional information

The species seems to be particularly susceptible to injury, causing atypical morphology which may lead to misidentification (Hayward & Ryland, 1995). Synonyms of *Mysis* or *Neomysis vulgaris* were in use in the early and continental literature, though Tattersall & Tattersall (1951) considered the specific *integer* (Leach) to have priority (Parker, 1979).

✓ Listed by

🔗 Further information sources

Search on:

Biology review

☰ Taxonomy

Phylum	Arthropoda	Arthropods, joint-legged animals, e.g. insects, crustaceans & spiders
Order	Mysida	Opossum shrimps and mysids
Family	Mysidae	
Genus	Neomysis	
Authority	(Leach, 1814)	
Recent Synonyms	-	

🌿 Biology

Typical abundance

Male size range 10-17mm

Male size at maturity

Female size range >9mm

Female size at maturity

Growth form Articulate

Growth rate 1-2mm/month

Body flexibility High (greater than 45 degrees)

Mobility

Characteristic feeding method Predator, Active suspension feeder

Diet/food source

Typically feeds on Detritus, diatoms, filamentous algae and small crustaceans.

Sociability

Environmental position Epibenthic

Dependency No information found.

Supports No information

Is the species harmful? No

🏛️ Biology information

Growth rate

In mature adults from the Ythan Estuary, Scotland, growth rate was recorded to be 1-2 mm per month in the field, which followed a rapid period of growth, of 4-5 mm per month in the summer juveniles (Astthorsson, 1980). The winter generation had a growth rate of 3-4 mm monthly for juveniles and about 1 mm per month for mature adults. During the winter there was a period of about 3 months when growth ceased (Astthorsson & Ralph, 1984).

Swimming behaviour

Neomysis integer performs a diel vertical migration, rising towards the surface waters during the night and returning to the deeper waters at daylight where it remains throughout the day (Hough & Naylor, 1992). Normal diurnal light levels are inhibitory and produce a negatively phototactic response in most species; the 24 hour cycle of change in ambient light intensity is the dominant factor controlling the diel vertical migration of mysids, such as *Neomysis integer* (Mauchline, 1980).

Maintenance of position

As a pelagic organism, *Neomysis integer* faces the problem of retaining its position within the estuarine environment, against conditions of net seaward transport (Hough & Naylor, 1992). In general, there are three main controls of the positioning of pelagic invertebrate populations in estuarine systems: reproductive compensation of seaward losses (a relatively large number of juveniles are produced per brood, behavioural adaptations (alterations in swimming activity at different tidal phases) and hydrodynamic process (distribution directly related to patterns of water circulation) (Schlacher & Wooldridge, 1994).

In laboratory experiments, Hough & Naylor (1992) found *Neomysis integer* to have an endogenously controlled circa-tidal swimming activity, with peak swimming activity expressed during the ebb tide. In the investigation of the significance of its endogenously controlled ebb tide swimming, Hough & Naylor (1992) observed *Neomysis integer* to demonstrate rheotactic behaviour. Typically on the ebb tide in the Conway Estuary, shallow pools of isolated water are left as the tide ebbs. Aggregations of *Neomysis integer* in imminent risk of stranding initially headed into the current, but as the water level dropped, and before a pool was completely cut off, the species swam with the current draining from the pool and entered the stream before finally re-orientating and swimming into the current. Hough & Naylor (1992) suggested that such rheotactic behaviour coupled a continuous ebb-phased swimming rhythm, may be of importance in the avoidance of stranding on the shore at low tide.

Maximum swimming speed by the mysid is also important, since it dictates in which flow velocities the species can maintain its position. Specimens studied by Roast *et al.* (1998b) from the East Looe River Estuary (Cornwall) tolerated current velocities of 6 and 9 cm s⁻¹, a few could swim at speeds of up to 27 cm s⁻¹, but was not sustainable for more than a few seconds. Roast *et al.* (1998b) found the swimming speeds of *Neomysis integer* correlated well with the distribution of the species in the East Looe River Estuary, where mysids were found consistently in slower moving water (<15 cm s⁻¹) and were absent in faster flowing water (>20 cm s⁻¹). Roast *et al.* (1998b) stated that if swimming speed is an important factor in the position maintenance of the species, it is likely to be beneficial for the mysid to utilize any available shelter in order to conserve energy. In experimental conditions, Roast *et al.* (1998b) observed *Neomysis integer* to attach themselves to the substratum, thereby entering the boundary layer where lower velocity flows are experienced. This corresponds with field studies, for instance in the Conway Estuary, North Wales, *Neomysis integer* was always caught in greatest abundance in near-bottom plankton samples (Hough & Naylor, 1992). On the ebb tide, during flood and high-tide periods in the Ythan Estuary, Scotland, the species was concentrated in a band toward the moving tide edge where flows were typically lower. Also on the ebb tide and at low tide the species aggregated in shallower water and in the lee of rocks and macroalgal clumps where water flow rates were less than 10 cm/sec (Lawrie *et al.*, 1999). Shallow burrowing into the sediment is also a common means of position maintenance in moving waters, and is a common behaviour of mysids inhabiting areas subject to tidal disturbance (Roast *et al.*, 1998b).



Habitat preferences

Physiographic preferences	Sea loch / Sea lough, Estuary, Isolated saline water (Lagoon)
Biological zone preferences	Lower infralittoral, Upper infralittoral
Substratum / habitat preferences	Coarse clean sand, Gravel / shingle
Tidal strength preferences	Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Strong 3 to 6 knots (1.5-3 m/sec.)
Wave exposure preferences	Sheltered, Very sheltered
Salinity preferences	Low (<18 psu), Reduced (18-30 psu), See additional Information

Depth range	5 - 10 m
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

Salinity tolerance

Neomysis integer is a euryhaline species normally found in locations with salinities in the range 0.5 - 20 psu. However, it may be found more rarely in adjacent isolated waters of salinities greater than 20 psu, and in freshwaters. For instance, *Neomysis integer* adapted successfully to the transition from brackish lagoon to freshwater lagoon in the case of Loch Mor Barvas, Isle of Lewis, Scotland (Barnes, 1994).

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Annual protracted
Fecundity (number of eggs)	11-100
Generation time	See additional information
Age at maturity	2-3 months
Season	Spring - Autumn
Life span	<1 year

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Ovoviviparous
Duration of larval stage	Not relevant
Larval dispersal potential	100 -1000 m
Larval settlement period	Not relevant

Life history information

The life history and biology of *Neomysis integer* differs slightly between localities (Mees *et al.*, 1994; Astthorsson, 1980; Parker & West, 1979; Mauchline, 1971; Ralph, 1965; Kinne, 1955; Vorstman, 1951). Apparently the local environmental factors, especially temperature, have an influential role in determining the duration of the breeding season and the number of generations produced per year. Typically there are three generations per year.

For instance, in a population from Loch Etive, studied by Mauchline (1971), the overwintering members consisted predominantly of juveniles and immature males and females. Once mature they began an intensive period of breeding in the spring. The spring generation matured rapidly and bred during late June and early July, which consequently produced a third generation in the autumn. These intensive periods of breeding were set against a background of continuous breeding throughout the year, so that discrete generations were not evident, but modal age groups within the population could be traced over weeks, or in the case of the overwintering population, a

few months.

However, outside periods of intensive breeding the recruitment rate was lower: < 1% of females carried eggs and broods were smaller. Brood size in mysid shrimps has been found to be related to female body length and season (Mauchline, 1971). A winter brood of *Neomysis integer* from Loch Etive consisted of between 10-25 juveniles compared to 20-50 in the summer.

In contrast, to the population of *Neomysis integer* from Loch Etive, a population from the Ythan estuary on the east coast of Scotland studied by Astthorsson (1980), produced only two generations per year with a complete cessation of breeding during winter. Temperature differences between the two locations were implicated as the Ythan estuary had a much lower summer maximum temperature than Loch Etive (17°C cf. 20°C; Leach, 1971; Gage, 1974).

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.

A Physical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Substratum Loss	Tolerant	Not relevant	Not sensitive	Not relevant

Neomysis integer is a free-swimming mysid shrimp, which may rest on the surface of the substratum, but does not live within it. Therefore it has been assessed to be tolerant of substratum loss.

Smothering	Tolerant	Not relevant	Not sensitive	Not relevant
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Neomysis integer is a free-swimming mysid shrimp, which may rest on the surface of the substratum, but does not live within it and it is sufficiently mobile to avoid the deposition of smothering materials. Therefore *Neomysis integer* has been assessed to be not sensitive to smothering at the benchmark level.

Increase in suspended sediment	Tolerant*	Not relevant	Not sensitive*	Low
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Neomysis integer is omnivorous and employs one or both of two distinct methods of feeding. It may filter phytoplankton and suspended detrital material or feed as an active carnivore on zooplankton or benthic invertebrates. Consequently, increased concentrations of suspended matter in the water column may be indicative of an enhanced food supply and the species has been assessed not to be 'tolerant*'.

Decrease in suspended sediment	Low	Immediate	Not sensitive	Low
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Neomysis integer is omnivorous and employs one or both of two distinct methods of feeding. It may filter phytoplankton and suspended detrital material or feed as an active carnivore on zooplankton or benthic invertebrates. A reduction in the concentration of suspended matter in the water column may reduce the species viability as a consequence of reduced food supply. Therefore intolerance has been assessed to be low. On return to prior conditions, recovery is likely to be immediate as the shrimp commences optimal feeding.

Dessication	Not relevant	Not relevant	Not relevant	Not relevant
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Neomysis integer is likely to be very intolerant of continual exposure to air and sunshine for one hour and any individuals washed ashore would undoubtedly die. But the estuarine environment its endogenous swimming rhythm, coupled with a rheotaxic behaviour serves to prevent stranding on the substratum at low tide (Hough & Naylor, 1992) (see general adult biology). Therefore, dessication is probably not relevant.

Increase in emergence regime	Not relevant	Not relevant	Not relevant	Not relevant
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Neomysis integer is a free-swimming mysid shrimp, which is sufficiently mobile to avoid a change in the emergence regime in its estuarine environment. Therefore an intolerance assessment was not considered to be relevant.

Decrease in emergence regime	Not relevant	Not relevant	Not relevant	Not relevant
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Neomysis integer is a free-swimming mysid shrimp, which is sufficiently mobile to avoid a

change in the emergence regime in its estuarine environment. Therefore an intolerance assessment was not considered to be relevant.

Increase in water flow rate Intermediate Very high Low Moderate

In the field, where flows in the open channel over the tidal cycle were greater than that which *Neomysis integer* can swim against or maintain position, Lawrie *et al.*, (1999) observed *Neomysis integer* to aggregate in low-flow areas, such as in the lee of rocks and macroalgal clumps, in the shallowest edge waters and at the 'boundary layer' (sediment-water interface), where water flow rates were not in excess of 10 cm/sec (0.2 of a knot). Intolerance of *Neomysis integer* to the benchmark increase in water flow rate has been assessed to be intermediate. The species would be exposed to flow rates of between 0.5-1.5 m/sec and in the absence of objects behind which to shelter the species would be washed rapidly seawards. Some individuals may die following exposure to fully saline conditions (see increase in salinity) but the abundance of the population is more likely to be reduced as other coastal currents disperse the population and fewer may be washed back into the estuary on the flood tide. On return to prior conditions the species is likely to have a very high capacity for recovery (see additional information below).

Decrease in water flow rate Tolerant* Not relevant Not sensitive* Not relevant

The benchmark decrease in water flow rate would create areas where water flow was negligible and the species may be better able to maintain position in open water, potentially enabling enhanced periods of feeding with reduced risk of displacement from the estuarine environment. Therefore an assessment of tolerant* has been made.

Increase in temperature Intermediate Very high Low Moderate

Environmental temperature exerts an influence on many of the physiological processes of mysid shrimps (Mauchline, 1980). However, the tolerance of mysid shrimps to changes in environmental temperatures varies between species and, to a lesser extent, between populations of the same species in different environments (Mauchline, 1980). Very little information concerning environmental temperatures and the distribution of mysid shrimps is available. However, the distribution of *Neomysis integer* extends to the south of the UK, along the Atlantic coast of Spain, so the species may be able to tolerate a chronic change of 2 °C. Kinne (1955) found that juveniles of *Neomysis integer* had a different tolerance to temperature changes than adults. Kuhlman (1984) also found that over-wintering and summer generations of *Neomysis integer* demonstrated distinct differences to increasing temperature, the upper tolerance of the winter generation being 10-12 °C in comparison to 20-25 °C for the summer generation. Consequently, an acute increase in temperature may be more damaging to the population during the spring, when the over wintering population commences breeding, than at other times and intolerance has been assessed to be intermediate. Following a decrease in population, *Neomysis integer* is likely to recover within a few weeks or at most six months following summer recruitment and probable migration between suitable habitats, therefore recoverability has been assessed to be very high.

Decrease in temperature Intermediate Very high Low

The distribution of *Neomysis integer* extends to the north of the UK, along the Arctic coast of Norway, so the species may be able to tolerate a chronic change of 2 °C. Acute decreases in temperature may cause death of some vulnerable individuals, such as those that are parasitized owing to additional stress and intolerance has therefore been assessed to be intermediate. Following a decrease in population, *Neomysis integer* is likely to recover within a few weeks or at most six months following summer recruitment and probable migration between suitable habitats, therefore recoverability has been assessed to be very high.

Increase in turbidity Tolerant* Not relevant Not sensitive* Not relevant

In general, mysids are attracted to weak sources of light, but avoid bright light (Mauchline, 1980). Bright light often inhibits swimming activity. Normal diurnal light levels are inhibitory and produce a negatively phototactic response in most species and the 24 hour cycle of change in ambient light intensity is the dominant factor controlling the diel vertical migration of mysids. The nocturnal period of darkness stimulates the upward migration into the pelagic zone (Beeton, 1960; McNaught & Hasler, 1966; Heubach, 1969; Teraguchi *et al.*, 1975; cited in Mauchline, 1980). Increased turbidity may serve to extend the nocturnal vertical migration period of *Neomysis integer* during dawn and dusk, as turbidity inhibits light penetration. As diel migration is a normal behavioural pattern of *Neomysis integer* an increase in turbidity is unlikely to affect the species. Furthermore, increased turbidity may hinder predatory fish which feed upon *Neomysis integer*.

Decrease in turbidity Low Very high Very Low Low

In general, mysids are attracted to weak sources of light, but avoid bright light (Mauchline, 1980). Bright light often inhibits swimming activity. Normal diurnal light levels are inhibitory and produce a negatively phototactic response in most species and the 24 hour cycle of change in ambient light intensity is the dominant factor controlling the diel vertical migration of mysids. The nocturnal period of darkness stimulates the upward migration into the pelagic zone (Beeton, 1960; McNaught & Hasler, 1966; Heubach, 1969; Teraguchi *et al.*, 1975; cited in Mauchline, 1980). Decreased turbidity may serve to reduce the extent of the nocturnal vertical migration of *Neomysis integer*, as light penetration of the water column increases, and possibly limit feeding. Furthermore, fish may exploit populations of *Neomysis integer* more effectively as *Neomysis integer* probably becomes more easily distinguishable. Intolerance has been assessed to be low and on return to prior conditions recovery is likely to be very high (see additional information below).

Increase in wave exposure High Very high Low Very low

Wave action in the littoral region affects the distribution of many intertidal species and for mysids in particular it tends to depress their vertical range on the shore, they move offshore into deeper water in order to avoid the effects of breaking waves (Mauchline, 1980). *Neomysis integer* avoids water flow rates against which it cannot maintain position by sheltering in the lee of rock, macroalgal clumps and in the 'boundary layer' (see increased water flow rate). Increased wave exposure would increase the turbulence of water flow around objects used for shelter and may displace the object. Furthermore, mysids such as *Neomysis integer* demonstrate rheotaxis (orientate in flowing water, facing into the current) and such behaviour may become energetically exhausting if caught in the wash and back-wash of waves. Intolerance has therefore been assessed to be high. Recovery, following loss of the population is likely to be very high (see additional information, below).

Decrease in wave exposure Not relevant Not relevant Not relevant Not relevant

The estuarine environment inhabited by *Neomysis integer* is typically very/extremely wave sheltered and an assessment for a decrease in wave exposure was not considered relevant.

Noise Tolerant Not relevant Not sensitive Not relevant

Neomysis integer may respond to vibrations caused by noise, but it is unlikely to be directly sensitive to noise at the benchmark level.

Visual Presence Tolerant Not relevant Not sensitive Not relevant

Neomysis integer is unlikely to have the visual acuity to detect the presence of boats, machinery

present in its environment, and it has been assessed not to be sensitive to the factor.

Abrasion & physical disturbance Not relevant Not relevant Not relevant Not relevant

Neomysis integer is a free-swimming mysid shrimp and not likely to be damaged by a passing scallop dredge as it will probably avoid its effects. (see benchmark). Therefore, an intolerance assessment was not considered to be relevant.

Displacement Not relevant Not relevant Not relevant Not relevant

Neomysis integer is a free-swimming mysid shrimp and therefore cannot be physically displaced from the substratum. An intolerance assessment was considered not to be relevant.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Intermediate	Very high	Low	High

Several synthetic chemicals have been reported to have a toxic effect on *Neomysis integer*:

- Davies *et al.*, (1997) investigated the acute toxicity of Ivermectin (22, 23-dihydroavermectin B1), a proposed chemotherapeutant for the treatment of farmed salmon infested with sea lice, to *Neomysis integer*. The 96 hour LC₅₀ of Ivermectin to *Neomysis integer* was 70 ng/l, with 95% confidence limits of 44 ng/l and 96 ng/l. However, in assessing the potential risk to the marine environment from dissolved Ivermectin from use on fish farms, results indicated that the ratios of the 'Predicted Environmental Concentration' to the 'Predicted No Effect Concentrations' (PEC/PNEC) were small, and the authors suggested that direct toxic effects are unlikely.
- Following 7-day exposure to 0.038 µg chlorpyrifos/l, an organophosphate pesticide, *Neomysis integer* became hyperactive and more swam forward into a slow current (3 cm m⁻¹) than control mysids (Roast *et al.*, 2000b). However despite the hyperactivity, chlorpyrifos-exposed *Neomysis integer* were unable to swim faster than 15 cm m⁻¹, whereas control specimens were able to swim faster than 18 cm m⁻¹. In addition to changes in swimming behaviour, fewer pesticide exposed specimens were unable to maintain a position in the annular flume test tank, in comparison with control specimens, and 'swam' in higher current velocities (> 18 cm s⁻¹), a behaviour which is inconsistent with that in the field. Lawrie *et al.*, (1999) observed *Neomysis integer* to aggregate in low-flow areas, such as in the lee of rocks, macroalgal clumps and in the shallowest edge waters, where water flow rates were not in excess of 10 cm s⁻¹. Roast *et al.*, (2000b) suggested that such disruption to the swimming behaviour of *Neomysis integer* would reduce its ability to maintain position in the natural estuarine environment and populations would probably be lost. Furthermore, the swimming behaviour of *Neomysis integer* was affected at a pesticide concentration lower than the seven day LC₅₀ concentration of 0.084 µg chlorpyrifos per litre.

intolerance has been assessed to be intermediate. Sub-lethal effects (disruption of swimming) are experienced at low concentrations but are likely to cause the loss or reduce the abundance of estuarine populations owing to the inability of *Neomysis integer* to maintain position following contaminant exposure. The species is likely to have a very high capacity for recovery (see additional information, below) assuming the decay of the synthetic contaminant.

Heavy metal contamination	Intermediate	Very high	Low	High
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Roast *et al.*, (2000a) examined the effects of cadmium (Cd) on the swimming behaviour of *Neomysis integer*. Mysid shrimps such as *Neomysis integer*, maintain their optimum position in their habitat independent of the forces of river flow and tides; therefore any disruption of swimming behaviour will have significant implications for their survival and position maintenance (Roast *et al.*, 2000a). Following 7 day exposure cadmium, swimming behaviour (ability and orientation) in *Neomysis integer* was disrupted at $0.5 \mu\text{g Cd}_{(\text{aq})}^{2+}$ per litre, a significantly lower cadmium concentration than that causing mortality (7 day LC_{50} of $2.58 \mu\text{g Cd}_{(\text{aq})}^{2+}$ per litre).

Furthermore, toxicity of cadmium to *Neomysis integer* also varies with salinity. Wildgust & Jones (1998) found that mortalities resulting from free cadmium ion exposure were greater at salinities of 28 and 12 psu than at 20 psu. Wildgust & Jones (1998) thought that the reduction in toxicity of cadmium at a salinity of 20 psu was attributable to an interaction between the cadmium ion and some physiologically active mechanism of *Neomysis integer*. As the isosmotic point of *Neomysis integer* (19 psu) is close to 20 psu, the authors interpreted the results to implicate osmoregulation in mediating the uptake, and hence the toxicity, of cadmium to this euryhaline species.

intolerance has been assessed to be intermediate. Sub-lethal effects (disruption of swimming) are experienced at low concentrations but are likely to cause the loss or reduce the abundance of estuarine populations owing to the inability of *Neomysis integer* to maintain position following heavy metal exposure. *Neomysis integer* is likely to have a very high capacity for recovery (see additional information, below) assuming the loss of the heavy metal from the environment.

Hydrocarbon contamination

Intermediate

Very high

Low

High

Following the sinking of the tanker 'Sefir' during February, 1981, in the Baltic Sea, extreme mortality of littoral fauna, including mysids, was observed after the light fuel oil had washed ashore (Lindén *et al.*, 1983). Laughlin & Linden (1983) exposed *Neomysis integer* to water-soluble fractions (WSF) of light fuel oil under two different regimes. The first, a chronic exposure scheme, employed concentrations of between 200-500 ng WSF per litre and lasted two weeks. The second, acute exposure, employed concentrations of between 200 and 1000 $\mu\text{g WSF}$ per litre, concentrations that the authors thought representative of oil escaping from a sunken ship or in the vicinity of a spill, especially in sheltered conditions. During the acute exposures, physiological parameters of oxygen consumption, ammonium excretion rate and oxygen : nitrogen ratios were calculated. Exposure of *Neomysis integer* to WSF oil at concentrations between 200-1000 μg per litre produced increases in oxygen consumption and decreases in ammonia excretion, which were strongly influenced by temperature. Oil exposure had greatest effect on the species at higher temperature, especially 21.5 °C. In contrast, changes in the physiological parameters did not occur to such an extent during the chronic exposure, Laughlin & Linden (1983) considered that the oil doses were probably too low. Furthermore, Laughlin & Linden (1983) suspected that during the chronic exposures, increased temperature alone exerted an effect on *Neomysis integer* (mortality at time of moults) and the chronic effects of WSF were not measurable. However, in contrast, at temperature < 10 °C, the WSF did qualitatively affect the mysid shrimp. Intolerance has been assessed to be intermediate as some mortality arising from hydrocarbon exposure was reported in the field, and that the species may experience sub-lethal stress in physiological parameters. *Neomysis integer* is likely to have a very high capability for recovery following degradation of the oil in the environment (see additional information below).

Radionuclide contamination

Not relevant

Not relevant

Insufficient information.

Changes in nutrient levels Tolerant* Not relevant Not sensitive* Not relevant

Neomysis integer is normally resident in estuarine and lagoon environments with comparatively higher nutrient concentrations than that of the open coast. Nutrient enrichment that stimulates phytoplankton productivity may benefit *Neomysis integer*, as it is omnivorous and suspension feeds on both phytoplankton and suspended detrital material. Furthermore, *Neomysis integer* is sufficiently mobile to avoid inhospitable conditions that may result from eutrophication, and therefore it has been assessed to be tolerant*.

Increase in salinity High Very high Low High

Neomysis integer is a euryhaline species which typically occurs in brackish water habitats, and occasionally in freshwater habitats, but more rarely in fully marine conditions. In laboratory experiments, Kuhlman (1984) found the upper salinity tolerance of *Neomysis integer* to be between 20 psu to 25 psu, and mortality increased significantly at 30 psu. Under normal circumstances the species is typically found in waters of up to 20 psu, both the acute and chronic benchmark increases in salinity would expose *Neomysis integer* to a salinity to which it is intolerant. Therefore intolerance has been assessed to be high.

Decrease in salinity Tolerant Not relevant Not sensitive High

Neomysis integer is a euryhaline species which typically occurs in brackish water habitats, and occasionally in freshwater habitats which were once connected to the sea. For instance, *Neomysis integer* adapted successfully to the transition from brackish lagoon to freshwater lagoon in the case of Loch Mor Barvas, Isle of Lewis, Scotland (Barnes, 1994). In laboratory experiments, Kuhlman (1984) reported the lowest salinity tolerance of the species to be lower than 5 psu, and in other texts it is suggested that *Neomysis integer* tolerates salinities down to 0.5 psu (Koepcke & Kausch, 1996; Barnes, 1994). Therefore *Neomysis integer* has been assessed as not sensitive at the benchmark level decrease in salinity.

Changes in oxygenation Not relevant Not relevant Not relevant Not relevant

In laboratory experiments, Kuhlman (1984), lowered the oxygen saturation of seawater in which specimens of *Neomysis integer* were held over two days, to 20% (approximately 6.5 mg /O₂ per litre with no negative influence on behaviour or survival. A narrow sublethal and lethal threshold was determined between 20% (6.5 mg /O₂ per litre) and 13% (4.23 mg/O₂ per litre) saturation (Kuhlman, 1984). However, the species is sufficiently mobile to avoid sub optimal concentrations of oxygen and therefore an intolerance assessment of not relevant has been made.

Biological Pressures

Intolerance Recoverability Sensitivity Confidence

Introduction of microbial pathogens/parasites Not relevant Not relevant

Astthorsson (1980) found specimens of *Neomysis integer* collected from the Ythan Estuary, Scotland, to be parasitized by the third larval stage of the nematode *Thynnascaria adunca*. The nematodes were found in both the thorax and the abdomen, usually coiled. In some instances, the total length of the *Thynnascaria adunca* larvae was almost the same length as the *Neomysis integer* hosting it. Astthorsson (1980) suspected that the larvae would probably have an influence on the internal physiology of the host, but there is insufficient information concerning any effect upon the population that such parasitization may have.

Introduction of non-native species Not relevant Not relevant

No information concerning non-native species that might affect the abundance or survival of *Neomysis integer* was found.

Extraction of this species **Not relevant** **Not relevant** **Not relevant** **Not relevant**

Neomysis integer is not a species targeted for extraction. However, other mysid species have been harvested for human consumption and in Japan there is a commercial fishery of several species e.g. *Neomysis intermedia*, *Neomysis japonica*, *Acanthomysis mitsukurii* (Astthorsson, 1980).

Extraction of other species **Not relevant** **Not relevant**

No information concerning the extraction of other species that might affect the abundance or survival of *Neomysis integer* was found.

Additional information

Recoverability

Leuchs & Nehring (1996) described *Neomysis integer* as a rapidly growing species, with a high reproduction rate. It was able to rapidly recolonize and maintain a population over a 2 km stretch of the Elbe Estuary, Germany, that received dredged mud daily from the Brunsbuettel locks and had an otherwise impoverished fauna. Parker & West (1979) interpreted the ecology of *Neomysis integer* in the brackish Lough Furnace to be a compromise between r- and K-strategies. The reproductive strategy of mysid species is apparently K-selected, in that a relatively small number of offspring are produced which are released from the female brood pouch at an advanced stage. Thereafter, *Neomysis integer* lives a short r-selected lifespan, is small in size and reproduces intensively during the most favourable period of the year. However, as Parker & West (1979) pointed out, the compromise between the two strategies is fallible, and *Neomysis integer* experiences large fluctuations in population density. However, being planktonic, *Neomysis integer* can escape (at least partly) from adverse conditions by migration, for instance seasonality in the abundance of *Neomysis integer* was observed in the Swanpool Lagoon, Cornwall, into which the species migrated for the summer (Barnes *et al.*, 1979), and in the Severn Estuary where *Neomysis integer* over-wintered at comparatively low densities, but swarmed inshore during the summer with most females carrying eggs or embryos (Moore *et al.*, 1979). This evidence suggests that *Neomysis integer* would have a very high capacity for recruitment, recovery, and re-population via migration after an impact.

Importance review

Policy/legislation

- no data -

Status

National (GB)
importance -

Global red list
(IUCN) category -

Non-native

Native -

Origin -

Date Arrived -

Importance information

- *Neomysis integer* has been studied as a potential food organism for mariculture purposes (Kuhlmann, 1984).
- Mysids are used routinely by regulatory authorities for conducting 96 hour LC₅₀ toxicity tests to evaluate the potential hazards of pollutants to aquatic ecosystems. *Neomysis integer* has been reported to be comparatively sensitive to trace metals and organophosphate pesticides (Roast *et al.*, 2001; Roast *et al.*, 2000, 2000b; Roast *et al.*, 1999, 1999b; Roast *et al.*, 1998; Wildgust & Jones, 1998) and it has been suggested that *Neomysis integer* may be a suitable alternative to the frequently used sub-tropical American mysid *Americamysis* (= *Mysidopsis*) *bahia* for testing the toxicity of chemical contaminants to European estuarine biota. Furthermore, *Neomysis integer* exhibits disrupted swimming activity in the presence of contaminants, which is a more sensitive endpoint for assessing the effects of contaminants on aquatic biota than mortality.
- Mysid shrimps such as *Neomysis integer* are ubiquitous members of the permanent, endemic hyperbenthic fauna of estuarine and other coastal systems. Mysid shrimps occurs in high numbers and their ecological importance, particularly their role in food chains as a link between the benthic and pelagic systems is becoming increasingly apparent (Roast *et al.*, 1998). Estuaries function as nurseries for several important demersal fish species, and *Neomysis integer* is known to be important in the diets of; [Pomatoschistus minutus](#), [Trisopterus luscus](#), [Merlangius merlangus](#), [Platichthys flesus](#), [Trigla lucerna](#), [Clupea harengus](#) and [Pleuronectes platessa](#) (Hostens & Mees, 1999).

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