Osmoregulation and Water Permeability of Arctic Marine Isopods, *Mesidotea entomon*, *M. sibirica* and *M. sabini*.

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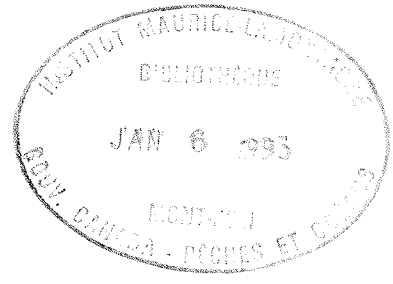

April 1978

OSMOREGULATION AND WATER PERMEABILITY OF ARCTIC MARINE ISOPODS, MESIDOTEA ENTOMON, M. SIBIRICA AND M. SABINI

by

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ABSTRACT

Percy, J. A., P. Vermette, P. Bouchard, and J. Fife. 1978. Osmoregulation and water permeability of arctic marine isopods, Mesidotea entomon, M. sibirica and M. sabini. Fish. Mar. Serv. Data Rep. 76: 163 p.

This report serves as a repository for tabular data relating to the osmoregulatory physiology of the Arctic marine isopods, Mesidotea entomon, M. sibirica and M. sabini from the southern Beaufort Sea. A freshwater form of M. entomon occurring in a lake in the Mackenzie Delta was also studied. This report contains data on temperature tolerance, salinity tolerance, osmoregulatory capabilities and water permeability characteristics of the three species.

RESUME

Percy, J. A., P. Vermette, P. Bouchard, and J. Fife. 1978. Osmoregulation and water permeability of arctic marine isopods, Mesidotea entomon, M. sibirica and M. sabini. Fish. Mar. Serv. Data Rep. 76: 163 p.

Ce rapport sert de répertoire pour les données tabulaires reliées à la physiologie d'osmorégulation des isopodes marins de la mer de Beaufort dans l'Arctique, Mesidotea entomon, M. sibirica et M. sabini. L'espèce d'eau douce de M. entomon qui habite un lac dans le delta du Mackenzie a été aussi étudiée. Ce rapport contient les données sur la tolérance de température, la tolérance de salinité, la capacité d'osmorégulation et la perméabilité à l'eau des trois espèces mentionnées ci-haut.

INTRODUCTION

Three isopods of the genus Mesidotea, M. entomon, M. sibirica and M. sabini are abundant in the coastal waters of the southern Beaufort Sea. They form an important component of the benthic community, acting as voracious scavengers and serving as food for a variety of fish and marine mammals. Their general biology and distribution in the western Arctic have been discussed by Bray (1962). Bray's study, and our own recent investigations have shown that, of the three, only M. entomon penetrates into the shallow coastal areas that are strongly influenced by the warm low salinity outflow of the Mackenzie River. The species has, in fact, become established in at least one of the freshwater lakes of the delta. The only other location in the Canadian Arctic where the species has been reported in freshwater is Greiner Lake on Victoria Island (Johnson, 1962).

In northwestern Europe M. entomon occurs widely in the brackish Baltic Sea as well as in several Swedish and Russian lakes (Segerstråle, 1957). The lakes in which it occurs have been successively isolated from the Baltic since the last ice age, and the freshwater and brackish water races have thus been completely separated for an extended period. In the Mackenzie Delta the separation of the marine and freshwater populations has been neither so prolonged nor so complete.

Studies on the European populations have shown that the Baltic animals cannot be experimentally adapted to freshwater, although the freshwater form readily tolerates brackish and even marine conditions (Bogucki, 1932; Lockwood and Croghan, 1957). A number of studies on the osmoregulatory physiology of the European populations of M. entomon

have been carried out (Bogucki, 1932; Lockwood and Croghan, 1957; Croghan and Lockwood, 1968; Vinogradov, 1973).

Mesidotea sibirica and M. sabini are restricted to the Arctic Ocean. Brunn (1924) considered M. entomon and M. sibirica to be the same species. However, Ekman (1967) regards M. sibirica as the parental form of the species M. entomon. The phylogenetic affinities of M. sabini are uncertain. The species has become well adapted for burrowing shallowly in soft sediments, being tubular in shape and having lost its eyes. Nothing is known about the osmoregulatory physiology of either of the species.

The present comparative study of the osmoregulatory physiology of the three species was undertaken in conjunction with a study of the relative distribution of the three species in the vicinity of the Mackenzie Delta. Salinity and temperature tolerances, osmoregulatory capabilities and water permeability characteristics have been examined. Particular attention has been paid to a comparison of the osmoregulatory physiology of the marine and freshwater forms of M. entomon.

METHODS

Collection of animals

The terms "marinus" and "limnos" used in this report to designate the marine and freshwater forms of M. entomon have no formal taxonomic significance. They are used simply as convenient labels and do not necessarily imply the existence of two sub-species or physiological races.

Mesidotea entomon (marinus) and M. sibirica were collected during July and August in baited traps in Ptarmigan Cove, Herschel Island, Northwest Territories (69°34'N, 138°59'W). In this region M. entomon (marinus) is abundant in the brackish inshore water (<7 m depth) while M. sibirica occurs in large numbers in the deeper marine water. The animals were held for one or two days in large polyethylene tanks of aerated seawater kept at 2°± 2°C. Animals were transported by air to Inuvik in 2 gallon jugs of cold seawater (2° ± 2°C).

Mesidotea sibirica was found to be extremely aggressive when crowded, biting off each other's legs and antennae. To avoid this they were shipped individually in seawater in small polyethylene bags. None of the other species posed a problem in this regard and could be readily shipped in groups.

Mesidotea sabini also occurs in Ptarmigan Cove. However, it is a burrowing form and is not as readily caught in baited traps as are the other two species. Animals were therefore collected during August by bottom trawling from the M.V. Salvelinus near the mouth of Liverpool Bay (69°59.7'N, 129°26.7'W) in about 7 meters of water. Additional samples of M. sibirica were also collected by trawling in this area.

Mesidotea entomon (limnos) were collected during July and August in Airport Lake, located about 8 miles to the south of Inuvik. Baited traps were set overnight in about 10 metres of water; 50-100 animals were usually caught in each trap.

In the Inuvik Laboratory the animals were held at 5°C in large (75-100 gallon) tanks of 30‰ Instant Ocean Seawater or in dechlorinated tapwater. The water was continuously aerated, filtered and changed regularly. Animals were fed twice a week with Tetramin flake fish food. Some animals were shipped to the Arctic Biological Station for further study and were there held in a recirculating seawater system at the same temperature and salinity. The marine species exhibited negligible mortality during transport. High mortality occurred with M. entomon (limnos) if the animals were shipped in lakewater or dechlorinated tapwater. Few animals died during transport if a small quantity (2‰) of Instant Ocean sea salt was added to the medium.

Salinity tolerance

Broad range: Groups of 5-10 animals were exposed at 0° ± 1°C to different salinities between 0‰ and 35‰ (at 5‰ increments) in 128 oz glass jars. Both filtered lake water and distilled water were used as 0‰ media in each test. The different salinities were prepared by diluting 35‰ Instant Ocean seawater with distilled water. Dead animals were counted and removed each day for 10 days. Animals were not fed during this period and the water was changed every three days. Results are expressed as a tolerance index obtained by summing the daily counts of live animals for the 10 day period and expressing

the total as a percentage of the maximum value that would be obtained if all of the animals remained alive for the whole period.

Narrow range: An additional series of salinity tolerance tests were carried out on M. entomon (marinus) in which groups of animals were exposed to different dilutions of 5‰ seawater. Groups of 10 animals were held in polyethylene trays at 0°C. They were examined daily for 15 days. A reference group of M. entomon (limnos) was also tested in 0‰ medium.

Cross acclimation: A gradual cross acclimation experiment was carried out at the Arctic Biological Station to determine if the freshwater M. entomon could be acclimated to seawater and conversely if the marine M. entomon could be acclimated to fresh water. M. sibirica was also tested to determine the effect of gradually decreasing salinity on its salinity tolerance. Duplicate groups of 8 animals each were placed in 4 liter plexiglass aquaria held at 5° ± 0.5°C. Initially, the M. entomon (marinus) and M. sibirica were placed in 25‰ seawater, while the M. entomon (limnos) was placed in 0‰ medium. The water was changed twice a week. At weekly intervals the salinity of the marine tanks was decreased by 5‰ increments until it reached 10‰ . It was then lowered to 7‰, 5‰, 2‰ and 0‰, again at weekly intervals. The salinity of the freshwater tanks was changed in the reverse fashion until it reached 30‰. Mortality was recorded at regular intervals. Animals were fed twice a week. The experiment was terminated after 135 days.

Temperature tolerance

Upper lethal temperatures were determined by exposing duplicate groups of 5-10 animals to a series of test temperatures and observing at regular intervals for 96 hours. The animals were transferred directly from the holding tanks (5°C) to the test jars (128 oz glass bottles) held at the desired temperatures (± 0.2°C). The water was changed daily and animals were not fed during the exposure. Dead animals were counted, measured and discarded at each observation period. They were considered dead if there was no detectable limb movement following light stimulation with a probe.

M. entomon (limnos) tolerates the stresses associated with transport and laboratory maintenance better in a low salinity (2-5°/₀₀) medium than in freshwater. It may be that the freshwater population is existing in a state of severe osmotic stress and is unable to tolerate the imposition of additional stresses. To examine the question of synergistic stresses further, an additional series of tolerance tests was conducted at the Arctic Biological Station. Groups of M. entomon (limnos) were acclimated for 5 days at 5°C in water of 0°/₀₀, 5°/₀₀ and 10°/₀₀ salinity. Groups of 10 animals adapted to the different salinities were then exposed to the test temperatures (between 23° and 30°C) in 64 oz jars containing continuously aerated water of the same salinity. Animals were not fed during the exposure and were transferred to fresh, temperature equilibrated seawater daily. Dead animals were counted and removed at regular intervals for 96 hours.

Osmoregulation

Collection of hemolymph: The animals were rinsed thoroughly in

deionized water and dried with Kimwipes. A small incision was made on the dorsal surface of the thorax between the segments and a small quantity of the clear hemolymph was collected in a capillary pipet and either transferred immediately to the osmometer sample platform or was frozen after sealing the tube with mineral oil.

Osmotic pressure determination: Osmotic pressure was measured with a Nanoliter Biological Cryostat Osmometer (Clifton Technical Physics, Hartford, N.Y.). Samples were collected and transferred to the osmometer platform with a capillary pipet connected to a micrometer syringe filled with immersion oil. Samples of approximately 14 nanoliters were measured in duplicate. The osmometer was calibrated with distilled water and a standard NaCl solution. The procedure was essentially as outlined in the instruction pamphlet supplied with the instrument.

Sampling in the field: To determine the osmotic pressure of the hemolymph of the animals in their natural habitat samples of hemolymph and seawater were taken at the time of collection. The samples were collected in alkali free capillary tubes that were sealed with immersion oil and frozen immediately on dry ice. Samples were transported to the lab on dry ice and after thawing were transferred to the osmometer platform using the capillary micropipet. Logistic problems with the dry ice prevented the collection of samples from M. sabini in the field.

Osmotic pressure and salinity: The osmoregulatory abilities of the animals were examined by measuring the hemolymph osmotic pressure following acclimation of the animals to a range of salinities between

0‰ and 45‰ (at 5‰ increments). Groups of 12 animals were transferred gradually from the holding salinity to the acclimation salinity in 5‰ increments, allowing at least 2 hours to adjust at each salinity. The animals were acclimated for an additional 3-5 days in 5 liter plexiglass tanks held at 5° ± 0.5°C. Fifty percent of the water in each tank was changed daily. Duplicate hemolymph samples were collected from each animal, and usually 8 animals of each species were sampled at each salinity. Samples of the seawater medium were also analyzed.

Loss of osmotic pressure in freshwater: The ability of the various species to resist dilution of the hemolymph following transfer to freshwater was examined. Thirty animals were placed in 128 oz glass jars (5 animals per jar) of continuously aerated dechlorinated tapwater at 5°C. Duplicate hemolymph samples were collected from five animals at each of the following times after transfer to freshwater: 0, 2, 4, 8, 24 and 48 hours. The M. entomon (limnos) and M. entomon (marinus) survived this short-term exposure. However, the M. sibirica became very lethargic after 24 hours exposure and many of them appeared close to death after 48 hours. Two of the animals in the first group died before 48 hours, so a second group of 5 was tested and of these two died. None of the M. sabini survived for 48 hours in the freshwater. Three different groups were tested, all with the same result. An additional series was conducted with M. entomon (marinus) in which the time of exposure to the freshwater was extended to 96 hours.

Adjustment to a salinity change: To determine the time required for hemolymph osmotic pressure to stabilize at a new level following a change in salinity, groups of animals were transferred from 30°/₀₀ to 15°/₀₀ seawater (at 5°C) and the hemolymph was sampled at regular intervals. Forty-eight animals of each species were initially transferred and duplicate hemolymph samples were collected from 6 animals after 0, 15, 30 and 60 minutes and after 3, 8, 24 and 48 hours. Seawater samples from each of the exposure tanks were also measured.

Long-term exposure to low salinity: A study was carried out to determine if M. entomon (limnos) maintains a lower osmotic pressure differential between the body fluids and the surrounding medium than does M. entomon (marinus) during extended exposure to low salinities. Groups of 52 animals of each population were held in 5°/₀₀ at 5°C for 27 days. The animals were kept in 5 gallon perforated polyethylene tanks held in a large aquarium. The M. entomon (marinus) was acclimated stepwise from the holding to the exposure salinity. Half of the water in the aquarium was changed weekly and animals were fed twice a week. At regular intervals 8 animals from each group were removed for hemolymph sampling. Samples of the medium were also collected.

Apparent water permeability of integument

Efflux method: The apparent permeability of the integument was initially determined by measuring the rate of efflux of tritiated water from the hemolymph into the surrounding medium. The animals were placed overnight in a loading solution containing 1 μC of tritiated water per ml. They were then thoroughly rinsed, drained and placed

individually in 50 ml of filtered seawater in covered storage dishes. Duplicate 25 µl samples of medium were collected with a capillary pipet after 10, 20, 30, 40, 60, 90, 120 minutes and 3, 4, 5 and 6 hours.

The specific activity of the medium at each observation was expressed as a percentage of that at equilibrium. Equilibrium samples were taken after the animals had been in the medium for at least six hours. The results were plotted on probability paper and the time to 50% unloading was estimated from the graph.

Influx method: A second method used to determine the apparent permeability of the integument was to measure the rate of influx of tritiated water from the medium into the hemolymph. The experimental animals were quickly dried with tissue and placed individually in storage dishes containing 200 ml of seawater medium labelled with 1 µC per ml of tritiated water. After exactly 45 minutes the animals were removed, rinsed and dried. Duplicate 10 µl hemolymph samples were taken with capillary micropipets via an incision in the dorsal surface of the thorax. Duplicate 10 ul samples of the seawater medium were also taken prior to the addition of the animals.

Determination of the permeability coefficient (K): The hemolymph and medium samples were placed in 10 ml of aquasol and counted for 10 minutes on a Nuclear Chicago Isocap 300 liquid scintillation counter. The samples were then spiked with a calibrated tritium standard and recounted. The corrected DPM values were then used to calculate the permeability coefficient (K) according to the following formula:

$$K = \frac{1}{T} \ln \frac{C_\infty}{C_\infty - C_T}$$

Where:

K = rate constant (hr^{-1})

T = duration of exposure to loading solution in hours

C_T = specific activity of hemolymph (dpm) after time T in loading solution

C_∞ = specific activity of hemolymph after equilibration; assumed to be the same as the specific activity of the external medium after equilibration.

Experimental conditions for permeability studies: The apparent water permeability of the isopods was determined under the following experimental conditions:

a) A series of preliminary influx and efflux studies were undertaken to elucidate the general nature of the water exchange process. Experimental details are included with the appropriate table headings and figure captions.

b) Permeability coefficients of each of the species were measured at 5°C salinities similar to those in the holding tanks; 25‰ for M. entomon (marinus), M. sibirica and M. sabini and 0‰ for M. entomon (limnos).

c) Permeability coefficients of M. entomon (marinus) and M. entomon (limnos) were measured at 5°C and at 15‰ after acclimation of the animals to these conditions for at least 3 days.

d) Permeability coefficients of a wide size range of *M. entomon* (marinus) were determined at 25‰ and 5°C.

e) Permeability coefficients were determined for animals immediately after a sudden salinity change. Groups of *M. entomon* (marinus) and *M. sibirica* were acclimated at 5°C and 25‰ salinity. The permeability coefficients were determined during exposure of the animals at 5°C in 10‰ salinity seawater.

f) The effect of salinity on the permeability coefficient of each of the species was examined. Groups of 10-12 animals were acclimated for at least 3 days at 5°C to a range of salinities between 0‰ and 35‰ (at 5‰ increments). Animals were transferred from the holding salinity to the acclimation salinity in 5‰ increments (at least 2 hours per step). Permeability coefficients were determined in seawater of the same salinity as that to which the animals were acclimated.

g) The effect of temperature on the permeability coefficient of each of the species was examined. Groups of 10-12 animals were acclimated at different temperatures for at least three days. *M. entomon* (marinus) was acclimated at 0°, 5°, 10° and 15°C in both 5‰ and 25‰ medium. *M. entomon* (limnos) was acclimated at 0°, 5°, 10° and 15°C in 0‰ medium. *M. sibirica* and *M. sabini* were acclimated

at 0°C and 10°C in 25‰ medium. The permeability coefficients were determined in seawater of the same temperature and salinity as that in which the animals were acclimated.

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Table 62. Statistical significance of differences in mean permeability coefficients (K) of different Mesidotea species at different salinities at 5°C.

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Figure 39. Comparison of the effects of temperature on the permeability coefficients (K) of M. entomon (marinus) M. entomon (limnos), M. sibirica and M. sabini.

Table 1. Salinity tolerance of adult M. entomon (marinus) at 0°C. Results expressed as number surviving at each observation; %Σ is the cumulative total of number of animals alive at each observation expressed as a percentage of the maximum possible value, i.e. all of the animals alive at all of the observation periods. (D) distilled water, (L) lakewater.

Salinity (°/₀₀)	Exposure Time (Days)										
	1	2	3	4	5	6	7	8	9	10	% Σ
0(D)	10	10	4	4	4	3	1	0	0	0	36
0(L)	10	10	9	9	6	5	4	4	0	0	57
5	10	10	10	10	10	10	10	9	9	9	97
10	10	10	10	10	10	10	10	10	10	10	100
15	10	10	10	10	10	10	10	10	10	10	100
20	10	10	10	10	10	10	10	10	10	10	100
25	10	10	10	10	10	10	10	10	10	10	100
30	10	10	10	10	10	10	10	10	10	10	100
35	10	10	10	10	10	10	10	10	9	9	98

Table 2. Survival of adult M. entomon (marinus) at low salinities between 5°/₀₀ and 0°/₀₀, at 5°C. Results expressed as in Table 1. Salinities expressed as a percentage of 5°/₀₀ seawater.

Elapsed Time (days)	Percent of 5°/₀₀ Seawater								
	100%	75%	50%	30%	20%	10%	5%	0%	0%*
1	10	10	10	10	10	10	10	9	10
2	10	10	10	10	10	10	10	7	10
3	10	10	10	10	10	10	10	5	10
4	10	10	10	10	10	10	10	3	10
5	9	10	10	10	10	10	8	2	10
6	9	10	10	10	10	10	8	1	10
7	9	10	10	10	10	10	7	0	10
8	9	10	10	10	10	10	7		10
9	9	10	10	10	10	10	7		10
10	9	10	10	10	10	10	7		9
11	9	10	10	10	10	10	7		9
12	9	10	10	10	9	10	7		9
13	9	10	10	10	9	10	7		9
14	9	10	10	10	9	10	7		9
15	9	10	10	10	8	10	3		9
%Σ	93	100	100	100	97	100	77	18	96
Osmotic Pressure of Medium (mOsm)									
Sample a	218	182	129	97	43	23	11	2	2
b	218	177	129	86	41	22	9	1	1
c	210	170	127	86	40	22	9	1	1
d	209	168	120	83	39	22	4	1	1
$\bar{x}$	214	174	126	88	41	22	8	1	1
Animal Length Range (mm)	50-75	54-76	50-78	46-79	58-72	57-72	55-80	41-80	31-48

*Survival of group of M. entomon (limnos) under the same experimental conditions.

Table 3. Salinity tolerance of early juvenile M. entomon (marinus). Animals released from brood pouch 3-5 days prior to exposure. Results expressed as in Table 1.

Elapsed Time (Days)	0°/₀₀(D)	0°/₀₀(L)	2°/₀₀	4°/₀₀	6°/₀₀
1	4	10	10	10	10
2	0	9	10	10	10
3	0	5	10	9	10
4	0	5	10	9	10
5	0	5	10	9	10
6	0	4	10	9	10
7	0	3	10	9	10
8	0	3	10	9	10
9	0	3	10	9	10
Σ%	4	52	100	92	100

Table 4. Salinity tolerance of M. entomon (limnos) at 0°C. Results expressed as in Table 1.

Salinity (°/₀₀)	Exposure Time (Days) 1	2	3	4	5	6	7	8	9	10	Σ	%Σ
0(D)	14	14	14	14	14	14	14	9	8	8	123	82
0(L)	15									15	150	100
5	15									15	150	100
10	15									15	150	100
15	15									15	150	100
20	15									15	150	100
25	15									15	150	100
30	15									15	150	100
35	14	14	14	14	14	14	14	14	13	13	138	92

Table 5. Salinity tolerance of M. entomon (limnos) at 10°C. Results expressed as in Table 1.

Salinity (°/₀₀)	Exposure Time (Days) 1	2	3	4	5	6	7	8	9	10	%Σ
0(D)	10	10	10	10	10	10	9	9	7	6	91
0(L)	10	10	10	10	10	10	10	10	9	9	98
5	10	10	10	10	10	10	10	10	10	10	100
10	10	10	10	10	10	10	10	10	10	10	100
15	10	10	10	10	10	10	9	9	9	9	96
20	9	9	9	9	8	8	7	7	7	7	80
25	10	10	10	10	10	10	10	9	9	9	97
30	9	9	9	9	9	8	8	6	5	5	77
35	10	10	10	10	9	9	9	9	9	8	93

Table 6. Salinity tolerance of M. sibirica at 0°C. Results expressed as in Table 1.

Salinity (°/₀₀)	Exposure Time (Days) 1	2	3	4	5	6	7	8	9	10	%Σ
0(D)	10	6	1	1	0	0	0	0	0	0	18
0(L)	5	3	1	1	1	1	0	0	0	0	12
5	10	10	9	7	7	7	7	7	7	6	77
10	10	10	10	9	3	3	1	1	1	1	49
15	10	10	10	10	10	10	10	10	10	9	99
20	10	10	10	10	10	10	10	10	10	10	100
25	10	10	10	10	10	10	10	10	10	10	100
30	10	10	10	10	10	10	10	10	10	10	100
35	10	10	10	10	10	10	10	10	10	10	100

Table 7. Salinity tolerance of M. sabini at 0°C. Results expressed as in Table 1.

Salinity (°/₀₀)	Exposure Time (Days) 1	2	3	4	5	6	7	8	9	10	%Σ
0(D)	8	3	1	0	0	0	0	0	0	0	12
0(L)	10	4	2	2	0	0	0	0	0	0	18
5	10	10	5	5	3	3	3	3	3	3	48
10	10	10	10	8	7	4	2	2	2	2	57
15	10	10	10	10	10	10	10	10	10	10	100
20	10	10	9	9	9	9	9	9	7	6	87
25	10	10	10	10	10	10	10	10	10	10	100
30	10	10	10	10	10	6	4	4	4	4	72
35	10	10	10	10	9	7	6	6	5	5	78

Table 8. Survival during cross-acclimation of M. entomon (marinus) and M. sibirica from seawater (25°/₀₀) to freshwater, and of M. entomon (limnos) from freshwater to seawater. Temperature 5°±1°C. Results expressed as number surviving at each observation. N = 16 for each group.

Day No.	Temp. (°C)	Salinity (°/₀₀)	limnos Survival	Salinity (°/₀₀)	marinus Survival	sibirica Survival
0		0	16	25	16	16
1	5.5	0	15	25	16	16
5	5.2	0	13	25	16	16
9	5.0	2	11	20	16	16
12	4.7	2	10	20	16	16
15	5.5	5		15		
18	5.2	5	10	15	16	16
22	5.5	7	9	10	16	16
25	4.4	7	9	10	16	16
29	5.8	10	8	7	16	16
33	4.3	10	8	7	16	16
36	4.9	15		5		
39	4.8	15	8	5	16	16
43	5.4	20	8	2	15	16
46	5.0	20	8	2	15	16
50	4.9	25	8	0	15	15
51	4.8	25	8	0	15	0
52		25	7	0	12	0
53	4.8	25	7	0	5	0
54		25	7	0	0	0
57	4.6	30	7	-	-	-
61	4.7	30	7	-	-	-
64	5.4	30	7	-	-	-
67	4.6	30	7			
74		30	7			
85		30	6			
135		30	5			

Table 9. Temperature tolerance of M. entomon (marinus) (15° to 24°C; 25°/₀₀). Results expressed as number surviving (1975 data).

Exposure Temp. (°C)	Exposure Time (Hrs) 1	4	24	48	72	96
15°	20	20	20	20	20	20
16°	20	20	20	20	20	20
17°	20	20	20	20	20	20
18°	20	20	19	18	18	18
19°	20	20	20	20	20	19
20°	20	20	20	20	20	20
21°	20	20	20	17	17	17
22°	20	20	20	20	20	20
23°	20	20	20	20	20	20
24°	20	20	19	19	19	19

Table 10. Temperature tolerance of M. entomon (marinus) (23° to 29°C; 25°/₀₀). Results expressed as number surviving (1976 data).

Exposure Temp. (°C)	Exposure Time (Hrs) 4	6	24	48	72	96
23°	10	10	10	10	10	10
24°	10	10	10	10	10	10
25°	10	10	10	10	10	10
26°	9	9	8	8	8	7
27°	9	9	8	1	1	1
28°	8	8	0	0	0	0
29°	6	6	5	2	0	0

Table 11. Temperature tolerance of M. entomon (limnos) (15° to 24°C; 0°/₀₀). Results expressed as number surviving (1975 data).

Exposure Temp. (°C)	Exposure Time (Hrs) 1	4	24	48	72	96
15°	20	19	19	18	18	14
16°	19	19	19	16	14	14
17°	20	20	20	20	19	18
18°	20	20	18	17	12	12
19°	20	20	20	19	19	18
20°	20	20	19	16	15	15
21°	18	18	17	15	12	10
22°	15	14	10	10	8	7
23°	20	20	16	12	8	2
24°	20	19	12	10	6	2

Table 12. Temperature tolerance of M. entomon (limnos) (23° to 29°C; 0°/$_{oo}$). Results expressed as number surviving (1976 data).

Exposure Temp. (°C)	Exposure Time (Hrs) 4	6	24	48	72	96
23°	10	10	9	9	9	9
24°	10	10	9	7	4	2
25°	10	10	9	5	4	2
26°	10	10	4	1	0	0
27°	10	10	3	0	0	0
28°	10	10	0	0	0	0
29°	1	1	0	0	0	0

Table 13. Effect of salinity (0°/₀₀-10°/₀₀) on the temperature tolerance of M. entomon (limnos) (23° to 30°C). N = 10 in each exposure group. Results expressed as number surviving.

Elapsed Time (h)	Exposure Temperature/Salinity								
	23°C			26°C			27°C		
	0°/₀₀	5°/₀₀	10°/₀₀	0°/₀₀	5°/₀₀	10°/₀₀	0°/₀₀	5°/₀₀	10°/₀₀
0	10	10	10	10	10	10	10	10	10
0.5	10	10	10	10	10	10	4	10	10
1	10	10	10	10	10	10	2	9	10
2	10	10	10	10	9	10	1	9	10
3	10	10	10	10	9	10	1	8	10
4	10	10	10	10	9	10	1	8	10
5	10	10	10	10	9	10	1	8	10
6	10	10	10	10	9	10	1	8	10
11.5	9	10	10	7	9	10	0	7	10
22	8	10	10	1	8	10	0	3	7
24	7	10	10	1	8	9	0	3	6
26	7	10	10	1	8	9	0	3	6
28	7	10	10	1	7	9	0	3	5
30	7	10	10	0	7	9	0	1	5
46.5	3	10	10	0	7	9	0	0	1
48	2	10	10	0	7	9	0	0	1
50	2	10	10	0	7	9	0	0	1
52	1	10	10	0	6	9	0	0	1
54	1	10	10	0	6	9	0	0	1
78	0	10	9	0	5	8	0	0	1
100	0	10	9	0	5	8	-	-	-
119	0	10	9	0	3	8	-	-	-
124	0	10	9	0	3	8	-	-	-
143.5	0	10	9	0	2	6	-	-	-

Table 13. (Continued)

Elapsed Time (h)	28°C 0°/₀₀	5°/₀₀	10°/₀₀	Elapsed Time (h)	30°C 0°/₀₀	5°/₀₀	10°/₀₀
0	10	10	10	0	10	10	10
0.5	1	9	10	0.25	0	10	10
1	0	5	10	0.5	0	5	8
1.5	0	4	10	0.75	0	0	5
2	0	4	9	1	0	0	4
3	0	3	8	1.25	0	0	3
4	0	2	7	1.5	0	0	0
5	0	2	7				
6	0	2	6				
11	0	1	3				
22	0	0	0				

Table 14. Summary of the effect of salinity on the temperature tolerance of M. entomon (limnos). Results expressed as LT_{50}-time in minutes to 50% mortality at a given exposure temperature. LT_{50} values estimated from graph of percent mortality against exposure time.

Exposure Temp. (°C)	Salinity 0°/₀₀	5°/₀₀	10°/₀₀
23°	2160	>8400	>8400
26°	900	4560	>8400
27°	25	840	1680
28°	17	60	453
30°	7.5	30	45

Table 15. Temperature tolerance of M. sibirica (15° to 24°C; 25°/₀₀). Results expressed as number surviving (1975 data).

Exposure Temp. (°C)	Exposure Time (Hrs) 1	4	24	48	72	96
15°	20	20	20	20	20	20
16°	20	20	20	20	20	20
17°	20	20	20	20	20	20
18°	20	20	20	20	20	20
19°	20	20	20	20	20	20
20°	20	20	20	20	20	20
21°	20	20	20	20	20	20
22°	20	20	19	18	16	15
23°	20	20	20	19	17	17
24°	20	20	16	4	1	0

Table 16. Temperature tolerance of M. sabini (15° to 22°C; 25°/$_{oo}$). Results expressed as number surviving (1975 data).

Exposure Temp. (°C)	Exposure Time (Hrs) 1	4	24	48	72	96
15°	10	10	10	10	10	10
16°	10	10	10	9	9	9
17°	10	10	10	10	10	10
18°	10	10	10	10	10	10
19°	10	10	10	10	10	10
20°	10	10	9	9	9	8
21°	10	10	10	9	9	7
22°	10	10	10	4	2	2

Table 17. Osmotic pressure (milliosmoles) of hemolymph of M. entomon (limnos) immediately after collection (Airport Lake, Inuvik, N.W.T.)

Hemolymph osmotic pressure

Animal Length (mm)	a	b	Mean	
46	556	554	555	
45	522	518	520	
38	528	528	528	
37	529	482	506	N = 10
43	525	521	523	$\bar{X}$ = 530
46	551	512	532	S.D. = 32
42	561	560	561	S.E. = 10
38	591	578	585	C.V. = 6.0%
42	513	514	514	
44	474	469	472	

Lakewater osmotic pressure

Salinity (°/₀₀)	a	b	Mean	
0	10	4	7	N = 4
	5	0	3	$\bar{X}$ = 4
	3	3	3	S.D. = 3
	0	1	1	S.E. = 1

Table 18. Osmotic pressure (milliosmoles) of hemolymph of M. sibirica immediately after collection. Ptarmigan Cove, Herschel Island, N.W.T.

Hemolymph osmotic pressure

Animal Length (mm)	a	b	c	d	Mean	
64	1111	1110	1106	1102	1107	
67	988	979	978	944	972	
73	855	855	855	851	854	N = 8
58	1070	1040	1039	1037	1047	$\bar{X}$ = 957
86	964	964	961	890	950	S.D. = 86
69	948	946	919	907	930	S.E. = 30
75	940	936	916	911	926	C.V. = 9.0%
65	872	868	868	855	866	

Seawater osmotic pressure

Salinity (°/₀₀)	a	b	c	d	Mean	
	890	860	835	830	854	$\bar{X}$ = 798
24	772	762	760	782	769	S.D. = 49
	781	778	765	761	771	S.E. = 28

Table 19. Osmotic pressure (milliosmoles) of hemolymph of M. entomon (marinus) immediately after collection (Ptarmigan Cove, Herschel Island, N.W.T.)

Hemolymph osmotic pressure

Animal Length (mm)	a	b	c	d	Mean	
70	889	881	860	-	877	
71	879	824	805	-	836	N = 7
49	935	906	902	874	904	$\bar{X}$ = 862
46	860	807	779	788	806	S.D. = 39
50	930	900	860	-	897	S.E. = 15
49	905	889	884	868	887	C.V. = 4.5%
56	850	850	810	790	825	

Habitat osmotic pressure

Salinity (°/₀₀)	a	b	c	d	Mean	
	460	460	445	435	450	$\bar{X}$ = 455
13	455	455	451	435	449	S.D. = 10
	480	466	465	455	467	S.E. = 6

Table 20. Osmotic pressure (milliosmoles) of hemolymph of female M. entomon (marinus) with brood lamellae, immediately after collection. (Pauline Cove, Herschel Island, N.W.T.)

Hemolymph osmotic pressure

Animal Length (mm)	a	b	Mean	
48	651	642	647	N = 5
50	637	642	640	$\bar{X}$ = 650
42	788*	661	661	S.D. = 9
46	657	659	658	S.E. = 4
47	639	646	643	C.V. = 1.4%

Seawater osmotic pressure

Salinity (°/₀₀)	a	b	Mean	
10	294	294	294	$\bar{X}$ = 294
	294	294	294	S.D. = 0

*Not included in calculation of mean.

Table 21. Osmotic pressure (milliosmoles) of hemolymph of M. entomon (marinus) following acclimation to different salinities (5°/₀₀ to 45°/₀₀ at 5°C).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
		48	820	785	803	240	220	230
		47	785	769	777	240	240	240
		45	765	759	762	190	190	190
5		49	720	710	715	215	205	210
		38	845	820	832	180	178	179
	M	44	753	706	730	170	177	174
	F	45	705	703	704			
	F	47	690	676	683			
				N = 8			N = 6	
				$\bar{X}$ = 751			$\bar{X}$ = 204	
				S.D. = 52			S.D. = 27	
				S.E. = 18			S.E. = 11	
				C.V. = 6.9%				
		49	711	691	701	380	347	364
		56	671	668	670	347	350	349
		45	780	765	773	338	337	338
10		47	880*	780	780	336	340	338
		49	783	788	786	395	376	386
	F	44	776	762	769	570*	390	390
	F	38	764	780	772	386	375	381
	M	49	759	705	732			
				N = 8			N = 7	
				$\bar{X}$ = 748			$\bar{X}$ = 364	
				S.D. = 43			S.D. = 22	
				S.E. = 15			S.E. = 8	
				C.V. = 5.7%				

*Not included in calculation of mean

Table 21 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
		44	784	844	814	444	444	444
		52	742	744	743	400	405	403
		44	737	727	732	495	494	495
15		49	680	640	660	576	566	571
		47	715	710	713	576	541	559
	M	55	795	795	795	522	425	504
	F	48	797	799	798	546	544	545
	F	40	831	829	830	521	488	505
				N = 8			N = 8	
				$\bar{X}$ = 761			$\bar{X}$ = 503	
				S.D. = 58			S.D. = 57	
				S.E. = 21			S.E. = 20	
				C.V. = 7.6%				
		43	913	913	913	600	585	593
		41	807	807	807	571	568	570
		43	866	846	856	570	570	570
20		51	806	810	808	635	637	636
		50	759	760	760	624	627	626
	F	42	735	755	745			
	F	40	770	770	770			
				N = 7			N = 5	
				$\bar{X}$ = 808			$\bar{X}$ = 599	
				S.D. = 59			S.D. = 31	
				S.E. = 22			S.E. = 14	
				C.V. = 7.3%				

Table 21 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
		40	848	841	845	790	790	790
		47	930	965	948	870	809	840
		47	826	817	822	805	785	795
25		42	943	843	893	735	-	735
	M	43	840	825	833			
	F	43	920	874	897			
	F	44	874	833	853			
	F	45	850	840	845			
				N = 8			N = 4	
				$\overline{X}$ = 867			$\overline{X}$ = 790	
				S.D. = 42			S.D. = 43	
				S.E. = 15			S.E. = 22	
				C.V. = 4.8%				
	F	45	1026	1014	1020	899	895	897
	M	45	1023	1025	1024	922	895	909
	M	46	955	988	972	949	945	947
30	M	43	955	955	955	930	930	930
	F	42	943	-	943	930	926	928
	F	49	944	915	930			
	M	54	995	950	973			
	M	52	960	950	955			
				N = 8			N = 5	
				$\overline{X}$ = 972			$\overline{X}$ = 922	
				S.D. = 34			S.D. = 19	
				S.E. = 12			S.E. = 9	
				C.V. = 3.5%				

Table 21 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
35	M	40	1035	1031	1033	1054	1042	1048
	M	45	1042	1028	1035	1145	1145	1145
	F	41	1145	1125	1135	1141	1061	1101
	F	43	1119	1118	1119	1142	1085	1110
	M	43	1119	1101	1110	1085	1066	1076
	M	42	1232	1140	1186			
	M	56	1210	1110	1160			
	F	54	1156	1061	1109			
					$\bar{N}$ = 8 $\bar{X}$ = 1111 S.D. = 54 S.E. = 19 C.V. = 4.9%			$\bar{N}$ = 5 $\bar{X}$ = 1096 S.D. = 36 S.E. = 16
40	F	46	1302	1280	1291	1368	1368	1368
	F	43	1280	1265	1273	1368	1366	1367
	M	45	1285	1295	1290	1382	1380	1381
	F	42	1320	1295	1308	1300	1300	1300
	F	44	1380	1401	1391	1490*	1335	1335
	F	45	1321	-	1321	1335	1335	1335
	M	52	1276	1276	1276			
	F	51	1245	1283	1264			
					$\bar{N}$ = 8 $\bar{X}$ = 1302 S.D. = 41 S.E. = 14 C.V. = 3.1%			$\bar{N}$ = 6 $\bar{X}$ = 1348 S.D. = 30 S.E. = 12

*Not included in calculation of mean.

Table 21 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
	F	48	1360	1360	1360	1476	1516	1496
	M	49	1360	1360	1360	1495	1446	1471
	F	45	1450	1450	1450	1494	1441	1468
45	M	49	1455	1450	1453			
	M	51	1346	1346	1346			
	F	49	1420	1354	1387			
	F	43	1420	1380	1400			
	M	52	1476	1574	1525			
				$\underline{N}$ = 8			$\underline{N}$ = 3	
				$\overline{X}$ = 1410			$\overline{X}$ = 1478	
				S.D. = 61			S.D. = 15	
				S.E. = 22			S.E. = 9	
				C.V. = 4.3%				

Table 22. Osmotic pressure (milliosmoles) of hemolymph of M. entomon (limnos) following acclimation to different salinities (0°/₀₀ to 45°/₀₀ at 5°C).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
0	M	44	390	379	385	-1	3	1
	M	43	334	333	334	19	17	18
	M	45	349	345	347	9	11	10
	M	41	441	442	442	3	3	3
	M	35	518	515	517			
	M	38	423	414	419			
	M	33	398	390	394			
	M	39	362	357	360			
				N = 8			N = 4	
				$\bar{X}$ = 400			$\bar{X}$ = 8	
				S.D. = 60			S.D. = 8	
				S.E. = 21			S.E. = 4	
				C.V. = 15.0%				
5	M	42	551	551	551	170	132	151
	M	44	551	551	551	128	134	131
	M	48	600	600	600	181	180	181
	M	47	566	564	565	141	133	137
	M	33	564	550	557			
	M	38	605	550	578			
	M	40	556	540	548			
	M	39	565	559	562			
				N = 8			N = 4	
				$\bar{X}$ = 564			$\bar{X}$ = 150	
				S.D. = 17			S.D. = 22	
				S.E. = 6			S.E. = 11	
				C.V. = 3.0%				

Table 22 (Continued).

Salinity (°/oo)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
10	M	43	637	569	603	363	363	363
	M	48	636	570	603	364	364	364
	M	44	552	554	553	359	357	358
	M	41	531	640	586	355	352	354
	M	38	600	597	599			
	M	35	583	579	581			
	M	40	591	590	591			
	M	39	599	594	597			
				N = 8			N = 4	
				$\bar{X}$ = 589			$\bar{X}$ = 360	
				S.D. = 17			S.D. = 5	
				S.E. = 6			S.E. = 2	
				C.V. = 2.9%				
15	M	51	627	623	625	493	491	492
	M	45	627	627	627	491	491	491
	M	46	659	659	659	518	489	504
	M	45	657	657	657	514	500	507
	M	40	647	644	646			
	M	39	722	720	721			
	M	38	667	662	664			
	M	42	651	648	649			
				N = 8			N = 4	
				$\bar{X}$ = 656			$\bar{X}$ = 499	
				S.D. = 30			S.D. = 8	
				S.E. = 11			S.E. = 4	
				C.V. = 4.6%				

Table 22 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
20	M	46	740	713	727	624	610	617
	M	49	681	681	681	613	608	610
	M	47	705	705	705	634	622	630
	M	43	714	691	703	637	636	637
	F	33	672	671	672			
	M	35	685	682	684			
	M	34	704	701	703			
	M	33	693	685	689			
				$\underline{N}$ = 8			$\underline{N}$ = 4	
				$\overline{X}$ = 696			$\overline{X}$ = 624	
				S.D. = 17			S.D. = 12	
				S.E. = 6			S.E. = 6	
				C.V. = 2.4%				
25	M	42	853	844	849	838	838	838
	M	47	779	779	779	838	838	838
	M	43	764	763	764	834	831	833
	M	39	785	781	783	834	832	833
	M	39	825	824	825			
	M	37	845	827	836			
	M	42	806	805	806			
	M	42	807	803	805			
				$\underline{N}$ = 8			$\underline{N}$ = 4	
				$\overline{X}$ = 806			$\overline{X}$ = 836	
				S.D. = 30			S.D. = 3	
				S.E. = 10			S.E. = 1	
				C.V. = 3.7%				

Table 22 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
30	M	46	988	988	988	1034	945	990
	M	50	988	975	981	947	949	948
	M	46	971	971	971	987	961	974
	M	48	968	973	971	959	956	958
	M	38	974	962	968			
	M	39	971	963	967			
	M	40	980	972	976			
	M	38	981	977	979			
				N = 8			N = 4	
				$\overline{X}$ = 975			$\overline{X}$ = 968	
				S.D. = 7			S.D. = 18	
				S.E. = 3			S.E. = 9	
				C.V. = 0.7%				
35	M	41	1085	1084	1085	1020	1020	1020
	M	44	1085	1083	1084	1021	1022	1022
	M	46	1076	1075	1076	1116	1111	1114
	M	43	1076	1075	1076	1110	1110	1110
	M	40	1059	1053	1056			
	M	39	1067	1065	1066			
	M	42	1055	1051	1053			
	M	42	1076	1074	1075			
				N = 8			N = 4	
				$\overline{X}$ = 1071			$\overline{X}$ = 1067	
				S.D. = 12			S.D. = 53	
				S.E. = 4			S.E. = 26	
				C.V. = 1.1%				

Table 22 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
40	M	51	1220	1217	1219	1290	1289	1290
	M	44	1220	1217	1219	1289	1289	1289
	M	45	1244	1205	1225	1323	1272	1298
	M	47	1248	1233	1241	1277	1273	1275
	M	38	1226	1226	1226			
	M	40	1224	1220	1222			
	M	42	1267	1266	1267			
	M	40	1260	1260	1260			
				$\overline{N}$ = 8 $\overline{X}$ = 1235 S.D. = 19 S.E. = 7 C.V. = 1.5%			$\overline{N}$ = 4 $\overline{X}$ = 1288 S.D. = 10 S.E. = 5	
45	M	43	1535	1535	1535	1443	1433	1438
	M	42	1535	1535	1535	1440	1435	1437
	M	42	1541	1537	1539	1443	1441	1442
	M	43	1543	1534	1539	1441	1440	1441
	M	39	1478	1476	1477			
	M	40	1463	1460	1462			
	M	40	1505	1501	1503			
	M	36	1509	1504	1507			
				$\overline{N}$ = 8 $\overline{X}$ = 1512 S.D. = 30 S.E. = 11 C.V. = 2.0%			$\overline{N}$ = 4 $\overline{X}$ = 1440 S.D. = 2 S.E. = 1	

Table 23. Osmotic pressure (milliosmoles) of hemolymph of M. sibirica following acclimation to different salinities (5°/₀₀ to 45°/₀₀ at 5°C).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
5	F	61	739	720	730	168	204	186
	F	54	680	674	677	168	168	168
	F	43	654	651	653	187	201	194
	F	58	648	618	633	192	183	188
	F	57	647	643	645	189	184	187
	F	62	651	646	649			
	F	53	654	650	652			
	F	61	649	646	648			
				$\overline{N}$ = 8			$\overline{N}$ = 5	
				$\overline{X}$ = 661			$\overline{X}$ = 185	
				S.D. = 31			S.D. = 10	
				S.E. = 11			S.E. = 5	
				C.V. = 4.7%				
10	M	58	690	677	684	415	363	389
	F	64	691	639	665	363	358	361
	M	58	693	691	692	298	294	296
	M	59	704	704	704	383	380	382
	F	67	702	697	700	383	381	382
	F	58	670	668	669			
	M	76	692	691	692			
	F	67	680	677	679			
				$\overline{N}$ = 8			$\overline{N}$ = 5	
				$\overline{X}$ = 686			$\overline{X}$ = 362	
				S.D. = 14			S.D. = 38	
				S.E. = 5			S.E. = 17	
				C.V. = 2.0%				

Table 23 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
	M	66	708	659	684	508	480	494
	F	46	740	745	743	480	479	480
	M	64	739	739	739	495	488	492
15	M	71	741	738	740	484	483	484
	F	57	730	726	728			
	M	68	746	745	746			
	M	77	744	737	741			
				$\overline{N}$ = 7			$\overline{N}$ = 4	
				$\overline{X}$ = 732			$\overline{X}$ = 488	
				S.D. = 22			S.D. = 7	
				S.E. = 8			S.E. = 3	
				C.V. = 3.0%				
	M	72	701	701	701	752	682	717
	M	46	875	856	867	669	656	663
	F	55	869	760	805	656	627	642
20	F	49	890	890	890	670	660	665
	M	79	828	810	819	654	652	652
	F	61	838	808	823	650	647	649
	M	81	835	829	832	648	637	643
	F		841	837	839			
				$\overline{N}$ = 8			$\overline{N}$ = 7	
				$\overline{X}$ = 822			$\overline{X}$ = 662	
				S.D. = 56			S.D. = 26	
				S.E. = 20			S.E. = 10	
				C.V. = 6.8%				

Table 23 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
25	M	67	993*	874	874	916*	736	736
	M	82	874	874	874	754	754	754
	M	74	922	901	912	776	766	771
	M	82	878	877	878	753	771	762
	M	74	841	838	840			
	M	85	880	879	880			
	M	84	869	859	864			
	M	90	877	872	875			
				$\overline{N}$ = 8			$\overline{N}$ = 4	
				$\overline{X}$ = 875			$\overline{X}$ = 756	
				S.D. = 20			S.D. = 15	
				S.E. = 7			S.E. = 7	
				C.V. = 2.3%				
30	F	44	954	907	931	901	890	896
	F	56	908	897	903	900	898	899
	M	65	969	963	966	875	874	875
	M	65	963	946	955	862	855	859
	M	79	970	969	970			
	F	53	967	966	967			
	F	53	964	961	963			
	M	85	978	973	976			
				$\overline{N}$ = 8			$\overline{N}$ = 4	
				$\overline{X}$ = 954			$\overline{X}$ = 882	
				S.D. = 25			S.D. = 19	
				S.E. = 9			S.E. = 9	
				C.V. = 2.6%				

*Not included in calculation of mean.

Table 23 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
35	M	68	1078	1076	1077	1217	1155	1186
	F	60	1078	1076	1077	1165	1155	1160
	M	64	1056	1039	1048	1099	1099	1099
	F	59	1043	1040	1042	1101	1094	1098
	M	49	1098	1084	1091	1069	1066	1068
	M	79	1096	1095	1096	1076	1073	1075
	M	85	1082	1082	1082	1063	1060	1062
	M	83	1090	1085	1088	1071	1066	1069
				$\overline{N}$ = 8 $\overline{X}$ = 1075 S.D. = 20 S.E. = 7 C.V. = 1.9%			$\overline{N}$ = 8 $\overline{X}$ = 1102 S.D. = 46 S.E. = 16	
40	M	72	1320	1314	1317	1201	1192	1197
	M	65	1357	1356	1357	1258	1195	1227
	M	67	1291	1292	1292	1221	1218	1220
	M	69	1339	1312	1326	1214	1209	1212
	F	56	1344	1340	1342	1287	1287	1287
	M	64	1330	1326	1328	1283	1283	1283
	M	71	1329	1326	1328	1286	1285	1286
	M	70	1322	1321	1322	1284	1281	1283
				$\overline{N}$ = 8 $\overline{X}$ = 1327 S.D. = 19 S.E. = 7 C.V. = 1.4%			$\overline{N}$ = 8 $\overline{X}$ = 1249 S.D. = 39 S.E. = 14	

Table 23 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
	F	61	1368	1319	1344	1439	1418	1429
	M	52	1437	1401	1419	1426	1417	1422
	F	53	1386	1289	1338	1433	1426	1430
45	M	56	1384	1346	1365	1418	1400	1409
	M	67	1366	1359	1363			
	M	75	1361	1357	1359			
	M	82	1372	1369	1371			
	M	80	1362	1358	1360			
				$\bar{N}$ = 8			$\bar{N}$ = 4	
				$\bar{X}$ = 1365			$\bar{X}$ = 1423	
				S.D. = 24			S.D. = 10	
				S.E. = 9			S.E. = 5	
				C.V. = 1.8%				

Table 24. Osmotic pressure (milliosmoles) of hemolymph of M. sabini following acclimation to different salinities (5°/₀₀ to 40°/₀₀ at 5°C).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
5	M	62	502	499	501	155	154	155
	M	63	536	534	535	151	150	151
	F	56	526	525	526	154	153	154
	F	53	525	522	524	153	153	153
	M	68	539	536	538			
	M	69	506	502	504			
	F	57	514	512	513			
	F	58	521	516	519			
				N = 8			N = 4	
				$\bar{X}$ = 520			$\bar{X}$ = 153	
				S.D. = 13			S.D. = 2	
				S.E. = 5			S.E. = 1	
				C.V. = 2.5%				
10	F	48	557	555	556	316	314	315
	F	64	540	537	539	314	312	313
	F	63	599	592	596	312	312	312
	M	66	597	596	597	311	308	310
	F	57	584	580	582			
	F	44	656	650	653			
	M	61	562	557	560			
	F	51	561	554	558			
				N = 8			N = 4	
				$\bar{X}$ = 580			$\bar{X}$ = 313	
				S.D. = 36			S.D. = 2	
				S.E. = 13			S.E. = 1	
				C.V. = 6.2%				

Table 24 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
	M	60	845	844	845	810	809	810
	M	58	833	829	831	808	808	808
	M	64	849	844	847	812	811	812
25	M	67	861	861	861	813	812	813
	M	59	796	795	796			
	F	64	801	799	800			
	M	67	824	821	823			
	F	56	829	826	828			
				N = 8			N = 4	
				$\bar{X}$ = 829			$\bar{X}$ = 811	
				S.D. = 23			S.D. = 2	
				S.E. = 8			S.E. = 1	
				C.V. = 2.8%				
	F	64	910	909	910	961	959	960
	M	63	909	901	905	959	958	959
	F	61	935	931	933	1010	984	997
30	M	58	932	927	930	983	983	983
	F	53	932	929	931			
	F	67	924	922	923			
	M	62	927	921	924			
	M	61	940	935	938			
				N = 8			N = 4	
				$\bar{X}$ = 924			$\bar{X}$ = 975	
				S.D. = 11			S.D. = 19	
				S.E. = 4			S.E. = 9	
				C.V. = 1.2%				

Table 24 (Continued).

Salinity (°/₀₀)	Sex	Animal Length (mm)	Hemolymph a	Hemolymph b	Hemolymph Mean	Medium a	Medium b	Medium Mean
35	M	66	1010	1003	1007	1022	1022	1022
	M	54	982	976	979	1020	1018	1019
	M	50	991	989	990	1001	997	999
	M	64	982	978	980	999	998	999
	F	67	988	984	986			
	M	47	980	977	979			
	F	58	987	985	986			
	M	51	986	980	983			
				$\overline{N}$ = 8			$\overline{N}$ = 4	
				$\overline{X}$ = 986			$\overline{X}$ = 1010	
				S.D. = 9			S.D. = 12	
				S.E. = 3			S.E. = 6	
				C.V. = 0.9%				
40	F	74	1091	1091	1091	1181	1180	1181
	M	63	1091	1090	1091	1180	1177	1179
	M	57	1115	1110	1113	1177	1175	1176
	F	60	1145	1143	1144	1176	1176	1176
	F	67	1142	1140	1141			
	M	53	1145	1143	1144			
	F	67	1138	1132	1135			
	F	68	1127	1126	1127			
				$\overline{N}$ = 8			$\overline{N}$ = 4	
				$\overline{X}$ = 1123			$\overline{X}$ = 1178	
				S.D. = 22			S.D. = 2	
				S.E. = 8			S.E. = 1	
				C.V. = 2.0%				

Table 25. Change in the hemolymph osmotic pressure of M. entomon (marinus) following transfer to freshwater (48 hour test). Animals acclimated in 25°/₀₀ medium at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
0	M	55	956	900	928	$\bar{X}$ = 849
	M	60	904	883	894	S.D. = 59
	M	48	767	805	786	S.E. = 26
	M	53	805	804	805	% = 100
	M	49	844	819	834	
2	F	48	811	809	810	$\bar{X}$ = 806
	M	55	786	777	782	S.D. = 17
	F	48	799	790	795	S.E. = 8
	M	46	825	812	819	% = 95
	M	57	825	818	822	
4	F	46	792	792	792	$\bar{X}$ = 774
	F	51	768	766	767	S.D. = 10
	M	44	768	771	770	S.E. = 5
	F	47	772	770	772	% = 91
	M	49	767	770	769	
8	M	58	738	738	738	$\bar{X}$ = 736
	M	47	738	769	754	S.D. = 11
	M	52	730	729	730	S.E. = 5
	F	46	730	731	731	% = 87
	F	45	728	728	728	
24	M	44	635	626	631	$\bar{X}$ = 634
	M	52	706	702	704	S.D. = 42
	F	47	595	594	595	S.E. = 19
	F	44	597	616	607	% = 75
	F	43	626	638	632	
48	M	55	546	532	539	$\bar{X}$ = 530
	F	47	570	568	569	S.D. = 61
	M	49	561	563	562	S.E. = 27
	M	47	437	409	423	% = 62
	M	49	563	549	556	

Medium osmotic pressure

a	b	Mean	
7	5	6	$\bar{X}$ = 4
4	1	3	S.D. = 1
4	3	4	S.E. = 1
4	2	3	

Table 26. Change in the hemolymph osmotic pressure of M. entomon (marinus) following transfer to freshwater (96 hour test). Animals acclimated in 25°/$_{oo}$ medium at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	Con.	
0	M	63	872	872	872	A	$\bar{X}$ = 879
	M	64	867	864	866	A	S.D. = 43
	M	66	962	947	954	A	S.E. = 19
	M	60	866	851	859	A	% = 100
	M	84	846	839	844	A	
4	M	44	737	736	737	A	$\bar{X}$ = 733
	M	54	733	733	733	A	S.D. = 4
	M	55	739	733	736	A	S.E. = 2
	M	54	733	724	729	A	% = 83
	F	47	733	726	730	A	
8	F	47	717	716	717	A	$\bar{X}$ = 717
	F	47	717	713	715	A	S.D. = 5
	F	48	744	701	723	A	S.E. = 2
	M	50	739	700	720	A	% = 81
	M	52	711	707	709	A	
24	M	49	578	574	576	A	$\bar{X}$ = 565
	F	47	575	569	572	A	S.D. = 25
	M	47	585	578	582	A	S.E. = 11
	M	54	575	570	573	A	% = 64
	F	48	523	519	521	A	
48	M	54	537	536	537	A	$\bar{X}$ = 533
	F	49	519	516	518	A	S.D. = 11
	F	45	528	523	526	A	S.E. = 5
	M	71	548	541	545	A	% = 61
	F	52	540	537	539	A	
72	F	50	329	327	328	A	$\bar{X}$ = 319
	M	51	312	308	310	A	S.D. = 7
	M	52	324	317	321	A	S.E. = 3
	M	42	317	315	316	A	% = 36
	F	57	323	317	320	L	
96	M	54	242	231	237	A	$\bar{X}$ = 243
	F	49	239	230	235	L	S.D. = 7
	M	59	253	249	251	L	S.E. = 3
	F	47	250	246	248	L	% = 28
	M	49	248	241	245	L	

Medium osmotic pressure

a	b	Mean	
0	1	1	$\bar{X}$ = -2
-4	-3	-4	S.D. = 1
-3	-2	-3	S.E. = 1
-3	-1	-2	

Table 27. Change in the hemolymph osmotic pressure of M. entomon (limnos) following transfer to freshwater (48 hour test). Animals acclimated in 0°/₀₀ medium at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	Con.	
0	M	35	721	718	720	A	$\bar{X}$ = 665
	M	45	637	635	636	A	S.D. = 52
	M	39	666	607	637	A	S.E. = 23
	M	37	722	722	722	A	% = 100
	M	42	621	601	611	A	
2	M	45	623	580	602	A	$\bar{X}$ = 646
	M	44	715	655	685	A	S.D. = 56
	M	36	680	678	679	A	S.E. = 25
	M	37	569	568	569	A	% = 97
	F	33	718	667	693	A	
4	M	47	713	647	680	A	$\bar{X}$ = 652
	M	33	650	645	648	A	S.D. = 17
	M	34	662	648	655	A	S.E. = 8
	M	41	644	628	636	A	% = 98
	M	35	653	627	640	A	
8	M	36	676	672	674	A	$\bar{X}$ = 664
	M	41	685	681	683	A	S.D. = 31
	M	36	686	670	678	A	S.E. = 14
	M	37	692	662	677	A	% = 100
	M	42	618	602	610	A	
24	M	38	677	673	675	A	$\bar{X}$ = 654
	M	36	648	637	643	A	S.D. = 17
	M	37	642	638	640	A	S.E. = 8
	M	39	653	628	641	A	% = 98
	M	32	672	667	670	A	
48	M	40	701	693	697	A	$\bar{X}$ = 664
	M	46	655	651	653	A	S.D. = 27
	M	44	635	633	634	A	S.E. = 12
	F	34	653	644	649	A	% = 100
	M	36	689	688	689	A	

Medium osmotic pressure

a	b	Mean	
5	3	4	$\bar{X}$ = 3
4	4	4	S.D. = 2
2	1	2	S.E. = 1
-1	1	0	

Table 28. Change in the hemolymph osmotic pressure of M. sibirica following transfer to freshwater (48 hour test). Animals acclimated in 25°/$_{oo}$ medium at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	Con.	
0	M	89	923	899	911	A	$\bar{X}$ = 910
	M	91	920	899	910	A	S.D. = 9
	M	72	917	872	895	A	S.E. = 4
	M	78	918	918	918	A	% = 100
	M	93	920	911	916	A	
2	M	69	864	852	858	L	$\bar{X}$ = 868
	M	71	907	906	907	L	S.D. = 22
	M	76	859	856	858	A	S.E. = 10
	M	51	859	853	856	A	% = 95
	F	61	862	858	860	L	
4	F	56	796	793	795	EL	$\bar{X}$ = 774
	M	68	792	775	784	L	S.D. = 15
	F	59	770	762	766	L	S.E. = 7
	F	63	761	756	759	L	% = 85
	F	62	767	763	765	L	
8	M	82	666	662	664	L	$\bar{X}$ = 669
	M	80	668	665	667	L	S.D. = 8
	M	81	676	674	675	L	S.E. = 4
	M	89	662	660	661	L	% = 74
	M	89	681	678	680	L	
24	M	87	651	644	648	L	$\bar{X}$ = 632
	M	73	610	606	608	L	S.D. = 16
	M	93	652	625	639	L	S.E. = 7
	M	80	630	616	623	L	% = 70
	M	85	645	640	643	L	
48	M	86	363	362	363	L	$\bar{X}$ = 393
	M	92	360	359	360	L	S.D. = 31
	M	87	436	430	433	L	S.E. = 14
	M	91	407	402	405	L	% = 43
	M	81	407	400	404	EL	

Medium osmotic pressure

a	b	Mean	
2	1	2	$\bar{X}$ = 2
3	3	3	S.D. = 1
2	1	2	S.E. = 1
2	0	1	

Table 29. Change in the hemolymph osmotic pressure of M. sabini following transfer to freshwater (48 hour test). Animals acclimated in 25°/₀₀ medium at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
0	M	76	827	823	825	$\bar{X}$ = 822
	M	75	822	817	820	S.D. = 5
	F	51	823	822	823	S.E. = 2
	M	71	828	825	827	% = 100
	M	67	815	810	813	
2	M	92	765	764	765	$\bar{X}$ = 762
	M	75	761	758	760	S.D. = 5
	M	78	769	763	766	S.E. = 2
	F	63	757	756	765	% = 93
	M	72	757	752	755	
4	M	74	751	751	751	$\bar{X}$ = 731
	F	52	728	725	727	S.D. = 12
	F	74	729	729	729	S.E. = 5
	M	52	728	725	727	% = 89
	M	73	721	716	719	
8	F	72	702	701	702	$\bar{X}$ = 705
	F	68	706	704	705	S.D. = 2
	M	74	706	706	706	S.E. = 1
	F	67	704	702	703	% = 86
	F	65	707	706	707	
24	M	70	578	578	578	$\bar{X}$ = 565
	F	55	581	579	580	S.D. = 18
	F	62	562	556	559	S.E. = 8
	M	60	537	536	537	% = 69
	M	57	572	568	570	
48*	---	---	---	---	---	---

Medium osmotic pressure

a	b	Mean	
4	-2	1	$\bar{X}$ = 0
-3	-4	-4	S.D. = 3
6	2	4	S.E. = 2
1	-2	-1	

* All of the animals died before the 48 hour observation. Two additional groups of animals placed in freshwater also succumbed within 48 hours.

Table 30. Change in hemolymph osmotic pressure (milliosmoles) of M. entomon (marinus) following a change in salinity from 30°/₀₀ to 15°/₀₀ at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
0	F	47	1001	1000	1001	
	M	62	1088	1082	1085	$\bar{X}$ = 1034
	M	57	1038	1034	1036	S.D. = 29
	F	41	1049	1037	1043	S.E. = 12
	M	39	1026	1023	1025	% = 100
	M	50	1017	1014	1016	
0.25	M	65	986	984	985	
	M	76	999	994	997	$\bar{X}$ = 996
	M	74	1005	999	1002	S.D. = 6
	M	68	1001	991	996	S.E. = 2
	M	75	999	993	996	% = 96
	M	77	998	996	997	
0.50	M	71	1006	979	993	
	M	74	1002	1001	1002	$\bar{X}$ = 966
	M	72	966	965	966	S.D. = 28
	M	69	966	961	964	S.E. = 11
	M	68	938	937	938	% = 93
	M	72	936	932	934	
1	M	62	1011	1007	1009	
	M	63	985	983	984	$\bar{X}$ = 965
	M	78	974	968	971	S.D. = 33
	M	69	912	911	912	S.E. = 14
	M	78	973	964	969	% = 93
	M	67	954	940	947	
3	M	53	910	909	910	
	M	67	899	695*	899	$\bar{X}$ = 921
	M	57	959	958	959	S.D. = 27
	F	44	952	949	951	S.E. = 11
	M	59	912	898	905	% = 89
	M	53	903	896	900	
8	M	55	908	901	905	
	M	61	898	896	897	$\bar{X}$ = 896
	F	51	901	894	898	S.D. = 6
	F	52	897	890	894	S.E. = 2
	M	59	888	885	887	% = 87
	F	57	894	889	892	

*Not included in calculation of mean.

Table 30 (Continued).

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
24	F	48	974	967	971	
	F	45	959	958	959	$\bar{X}$ = 940
	M	39	873	872	873	S.D. = 34
	F	47	948	945	947	S.E. = 14
	F	39	949	943	946	% = 91
	F	40	946	944	945	
48	F	49	848	847	848	
	F	42	804	803	804	$\bar{X}$ = 800
	F	42	795	762	779	S.D. = 25
	M	50	797	796	797	S.E. = 10
	F	40	789	787	788	% = 77
	F	45	788	779	784	

Medium osmotic pressure

Salinity (°/₀₀)	a	b	Mean	
15	498	494	496	
	516	514	515	$\bar{X}$ = 504
	500	495	497	S.D. = 9
	508	506	507	S.E. = 4
30	939	938	939	
	936	936	936	$\bar{X}$ = 935
	935	933	934	S.D. = 4
	930	930	930	S.E. = 2

Table 31. Change in hemolymph osmotic pressure (milliosmoles) of M. sibirica following a change in salinity from 30°/₀₀ to 15°/₀₀ at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
0	F	52	920	917	919	
	F	48	921	920	921	$\bar{X}$ = 918
	F	51	923	916	920	S.D. = 4
	F	54	914	909	912	S.E. = 2
	F	46	923	922	923	% = 100
	F	49	918	912	915	
0.25	M	55	916	910	913	
	F	70	907	904	906	$\bar{X}$ = 912
	F	60	911	909	910	S.D. = 4
	F	56	920	915	918	S.E. = 2
	F	61	912	910	911	% = 99
	M	70	916	913	915	
0.5	F	46	895	890	893	
	M	50	892	888	890	$\bar{X}$ = 890
	F	58	893	890	892	S.D. = 3
	M	54	892	887	890	S.E. = 1
	F	56	890	886	888	% = 97
	F	51	888	879	884	
1	M	51	858	851	855	
	F	47	862	859	861	$\bar{X}$ = 857
	F	46	856	855	856	S.D. = 3
	F	50	854	854	854	S.E. = 1
	M	53	864	858	861	% = 93
	F	46	860	851	856	
3	F	54	852	850	851	
	F	45	851	847	849	$\bar{X}$ = 850
	F	58	848	847	848	S.D. = 3
	M	48	848	844	846	S.E. = 1
	F	41	848	848	848	% = 93
	F	47	858	851	855	
8	F	57	766	758	762	
	F	52	765	763	764	$\bar{X}$ = 762
	F	43	763	761	762	S.D. = 2
	F	56	760	757	759	S.E. = 1
	F	53	762	759	761	% = 83
	F	47	761	761	761	

Table 31 (Continued).

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
24	F	48	755	750	753	
	F	51	747	744	746	$\bar{X}$ = 751
	F	53	755	754	755	S.D. = 4
	F	49	755	752	754	S.E. = 2
	F	50	753	748	751	% = 82
	F	51	751	743	747	
48	F	53	751	746	749	
	F	51	758	753	756	$\bar{X}$ = 753
	M	49	759	752	756	S.D. = 4
	F	46	758	754	756	S.E. = 2
	F	53	748	747	748	% = 82
	M	48	755	750	753	

Medium osmotic pressure

Salinity (°/₀₀)	a	b	Mean	
15	518	508	513	
	476	474	475	$\bar{X}$ = 504
	514	514	514	S.D. = 19
	514	512	513	S.E. = 10
30	943	940	942	
	943	939	941	$\bar{X}$ = 916
	904	890	897	S.D. = 30
	886	882	884	S.E. = 15

Table 32. Change in hemolymph osmotic pressure (milliosmoles) of M. sabini following a change in salinity from 30°/₀₀ to 15°/₀₀ at 5°C.

Hemolymph osmotic pressure

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
0	M	68	975	973	974	
	M	71	972	966	969	$\bar{X}$ = 970
	F	57	971	970	971	S.D. = 2
	M	63	969	964	967	S.E. = 1
	F	51	972	968	970	% = 100
	M	69	973	969	971	
0.25	M	74	983	982	983	
	M	58	975	972	974	$\bar{X}$ = 966
	M	73	972	968	970	S.D. = 14
	M	72	969	964	967	S.E. = 6
	F	58	952	948	950	% = 100
	M	74	951	946	949	
0.5	F	53	929	928	929	
	F	56	926	921	924	$\bar{X}$ = 931
	M	58	928	924	926	S.D. = 12
	F	61	927	922	925	S.E. = 5
	M	68	954	953	954	% = 96
	M	62	926	923	925	
1	F	53	919	913	916	
	F	49	918	910	914	$\bar{X}$ = 915
	F	54	913	906	910	S.D. = 7
	M	53	909	907	908	S.E. = 3
	M	85	917	909	913	% = 94
	M	59	929	928	929	
3	M	56	912	912	912	
	F	52	911	910	911	$\bar{X}$ = 884
	F	48	862	857	860	S.D. = 29
	M	54	908	905	907	S.E. = 12
	F	61	864	860	862	% = 91
	M	76	852	846	849	
8	M	68	805	802	804	
	M	67	799	794	797	$\bar{X}$ = 797
	F	51	801	794	798	S.D. = 6
	M	71	787	785	786	S.E. = 2
	F	58	801	798	800	% = 82
	F	63	798	792	795	

Table 32 (Continued).

Elapsed Time (h)	Sex	Animal Length (mm)	a	b	Mean	
24	M	74	804	802	803	
	F	78	793	788	791	$\bar{X}$ = 789
	M	67	760	755	758	S.D. = 17
	F	70	786	782	784	S.E. = 7
	M	78	800	796	798	% = 81
	M	56	801	800	801	
48	F	49	848	847	848	
	F	42	804	803	804	$\bar{X}$ = 799
	F	42	795	762	779	S.D. = 26
	M	50	797	796	797	S.E. = 11
	M	48	786	783	785	% = 82
	F	45	785	779	782	

Medium osmotic pressure

Salinity (°/₀₀)	a	a	Mean	
15	510	506	508	$\bar{X}$ = 502
	499	495	497	S.D. = 5
	504	504	504	S.E. = 2
	500	496	498	
30	941	937	939	$\bar{X}$ = 934
	932	925	929	S.D. = 4
	935	931	933	S.E. = 2
	939	933	935	

Table 33. Effect of acclimation (27 days) at low salinity (5°/₀₀) on the hemolymph osmotic pressure of M. entomon (marinus) and M. entomon (limnos). Animals transferred from holding salinities of 25°/₀₀ and 0°/₀₀, respectively, to the acclimation salinity (5°/₀₀) at time 0. (Temperature = 5°C.)

Hemolymph osmotic pressure (marinus)

Elapsed Time (days)	Sex	Animal Length (mm)	a	b	Mean	
0	F	46	870	825	848	
	M	60	755	750	753	
	M	52	812	811	812	$\bar{X}$ = 818
	M	58	749	747	748	S.D. = 45
	M	61	847	845	846	S.E. = 16
	M	57	827	814	822	
	M	51	862	860	861	
	F	48	855	851	853	
1	M	58	691	683	687	
	F	41	691	688	690	
	F	38	670	658	664	$\bar{X}$ = 697
	F	41	631	627	629	S.D. = 41
	M	45	728	725	727	S.E. = 15
	M	49	769	766	768	
	F	48	699	695	697	
	F	45	713	709	711	
3	M	36	754	748	751	
	F	48	641	633	637	$\bar{X}$ = 685
	F	46	672	670	671	S.D. = 35
	F	55	653	650	652	S.E. = 12
	F	39	701	700	701	t = 0.24
	F	49	701	699	700	p = 0.55
	F	43	684	682	683	
	F	45	686	685	686	
12	F	47	618	599	609	
	F	45	622	615	619	$\bar{X}$ = 654
	M	50	619	617	618	S.D. = 34
	M	55	669	666	668	S.E. = 12
	F	47	692	688	690	t = -0.29
	F	53	691	687	689	p = 0.60
	M	48	680	671	676	
	F	49	666	664	665	

Table 33 (Continued).

Hemolymph osmotic pressure (marinus)

Elapsed Time (days)	Sex	Animal Length (mm)	a	b	Mean	
14	F	51	699	695	697	$\bar{X}$ = 693 S.D. = 18 S.E. = 6 t = 0.68 p = 0.70
	M	48	698	695	696	
	F	46	713	688	701	
	F	50	710	692	701	
	F	37	708	700	704	
	F	40	656	650	653	
	M	43	710	702	706	
	F	40	693	670	682	
21	F	40	627	625	626	$\bar{X}$ = 619 S.D. = 29 S.E. = 10 t = 2.63 p = 0.01
	M	52	672	656	664	
	F	41	576	572	574	
	F	41	646	645	646	
	F	43	607	606	607	
	M	52	590	586	588	
	M	51	622	621	622	
	F	43	621	621	621	
27	F	49	724	713	719	$\bar{X}$ = 659 S.D. = 48 S.E. = 17 t = 1.41 p = 0.1
	M	43	715	711	713	
	F	38	602	593	598	
	M	44	587	582	585	
	M	41	674	667	671	
	F	43	667	661	664	
	M	45	669	663	666	
	F	41	653	652	653	

Hemolymph osmotic pressure (limnos)

Elapsed Time (days)	Sex	Animal Length (mm)	a	b	Mean	
0	M	45	776*	675	675	$\bar{X}$ = 656 S.D. = 35 S.E. = 12
	M	43	684	666	675	
	M	44	645	642	644	
	M	43	583	577	580	
	M	41	663	647	655	
	M	42	694	693	694	
	M	38	646	645	646	
	M	35	679	675	677	

*Not included in calculation of mean.

Table 33 (Continued).

Hemolymph osmotic pressure (limnos)

Elapsed Time (days)	Sex	Animal Length (mm)	a	b	Mean	
1	M	48	555	551	553	$\bar{X}$ = 639 S.D. = 46 S.E. = 16
	M	39	584	582	583	
	F	34	685	676	681	
	M	42	677	667	672	
	M	43	674	671	673	
	M	50	671	649	660	
	F	42	649	648	649	
	M	44	642	640	641	
3	M	48	685	671	678	$\bar{X}$ = 681 S.D. = 27 S.E. = 10
	M	48	672	668	670	
	F	43	699	678	689	
	F	38	633	628	631	
	M	42	685	681	683	
	M	48	670	668	669	
	M	40	697	697	697	
	M	39	728	726	727	
12	M	46	657	650	654	$\bar{X}$ = 658 S.D. = 12 S.E. = 4
	M	47	664	662	663	
	M	36	674	663	669	
	M	44	672	662	667	
	M	44	689	656	673	
	M	44	653	628	641	
	F	41	652	644	648	
	M	43	649	647	649	
14	M	43	682	680	681	$\bar{X}$ = 680 S.D. = 47 S.E. = 17
	M	50	615	586	598	
	M	46	702	689	696	
	M	38	700	689	695	
	M	43	770	762	766	
	M	47	700	682	691	
	M	44	660	659	660	
	M	38	657	653	655	
21	M	38	592	590	591	$\bar{X}$ = 581 S.D. = 25 S.E. = 9
	M	42	630	609	620	
	M	43	538	534	536	
	M	41	568	561	565	
	M	36	600	596	598	
	M	41	578	574	576	
	M	46	591	585	588	
	M	38	573	568	571	

Table 33 (Continued).

Hemolymph osmotic pressure (limnos)

Elapsed Time (days)	Sex	Animal Length (mm)	a	b	Mean	
27	M	38	645	644	645	$\bar{X}$ = 632 S.D. = 16 S.E. = 6
	M	36	641	641	641	
	F	37	651	647	649	
	M	36	651	649	650	
	F	34	620	619	620	
	M	34	620	617	619	
	M	32	615	610	613	
	F	31	619	613	616	

Medium osmotic pressure

Elapsed Time (days)	a	b	Mean	
0	200	192	196	$\bar{X}$ = 193 S.D. = 17 S.E. = 8
	168	167	168	
	204	204	204	
	204	202	203	
1	178	176	177	$\bar{X}$ = 172 S.D. = 5 S.E. = 3
	175	175	175	
	168	167	168	
	166	165	166	
3	204	202	203	$\bar{X}$ = 189 S.D. = 17 S.E. = 8
	175	162	169	
	219	167	202	
	184	175	180	
12	210	202	206	$\bar{X}$ = 203 S.D. = 9 S.E. = 4
	196	189	193	
	200	198	199	
	211	214	213	
14	214	212	213	$\bar{X}$ = 205 S.D. = 5 S.E. = 3
	205	199	202	
	204	202	203	
	204	200	202	
21	186	182	184	$\bar{X}$ = 181 S.D. = 2 S.E. = 1
	181	176	179	
	180	180	180	
	182	180	181	
27	235	232	234	$\bar{X}$ = 213 S.D. = 15 S.E. = 8
	206	202	206	
	214	210	212	
	202	194	198	

Table 34. Effect of long-term acclimation of M. entomon (marinus) and M. entomon (limnos) at 5°/₀₀ on the osmotic pressure differential (O.P.D.) between the hemolymph and the medium (data from Table 33).

Exposure Time (days)	marinus Hemolymph O.P.	limnos Hemolymph O.P.	Medium O.P.	marinus O.P.D.*	limnos O.P.D.*	t	p
0	818	656	193	625	463	7.52	0.005
1	697	639	172	525	467	2.49	0.025
3	685	681	189	496	492	0.24	0.55
12	654	658	203	451	455	-0.29	0.60
14	693	680	205	488	475	0.68	0.70
21	619	581	181	438	400	2.63	0.01
27	659	632	213	446	419	1.41	0.1

*O.P.D. = hemolymph O.P. - medium O.P.

Table 35. Uptake of tritiated water from labelled medium by Mesidotea entomon (marinus) at 25‰ and 5°C during a 72 h incubation period. Medium and hemolymph samples collected from three animals at each time period.

	Incubation Time (hrs)	a	b	c	$\bar{X}$	S.D.	S.E.
Medium	1	57382	56649	56838	56956	381	220
	2	55380	57545	55926	56284	1126	650
	4	54439	55705	54509	54884	712	411
	6	55132	56332	55975	55813	616	356
	48	55120	59304	58131	57518	2158	1246
	72	54890	54680	56205	55258	827	477
Hemolymph	1	40641	38472	34072	37728	3347	1932
	2	50845	50202	49305	50117	773	446
	4	52994	51355	52077	52142	821	474
	6	55039	53907	52707	53884	1166	673
	48	53747	51971	54253	53324	1198	692
	72	52857	55942	55700	54833	1716	991

Table 36. Uptake of tritiated water from labelled medium by Mesidotea entomon (marinus) at 25‰ and 5°C during a 3 h incubation period. Medium and hemolymph samples collected from three animals at each time period.

	Incubation Time (mins)	a	b	c	$\bar{X}$	S.D.	S.E.
Medium	15	56494	56059	55215	55923	650	375
	30	57577	56489	56262	56776	703	406
	45	56890	58758	55568	57072	1603	925
	60	55725	55411	55994	55710	292	169
	90	57402	56251	54938	56197	1233	712
	120	54970	56817	56317	56035	955	551
	180	55540	55539	53940	55006	923	533
Hemolymph	15	18765	16117	11223	15368	3826	2209
	30	35127	18072	27891	27030	8560	4942
	45	27533	33745	34372	31883	3781	2183
	60	42598	39690	40664	40984	1480	854
	90	42288	37770	42606	40888	2705	1562
	120	49751	52705	45567	49341	3587	2071
	180	50775	51075	50833	50894	159	92

Table 37. Effect of animal size on the permeability coefficient (K) of M. entomon (marinus). Acclimation and incubation at 25‰ and 5°C.

Animal Length (mm)	Medium dpm	Hemolymph dpm	K
82	61465	17663	0.45
44	60066	37442	1.30
41	61155	34076	1.09
38	61825	34283	1.08
49	58694	36971	1.33
78	57635	24576	0.74
46	56029	30855	1.07
73	56479	21204	0.63
34	57929	25827	0.79
33	58100	40035	1.55
33	56303	33354	1.20
58	56713	22301	0.67
68	53973	22815	0.73
29	59288	36399	1.27
25	58432	38693	1.45

Coefficients of regression equation, K = a + b (animal length, mm)

intercept a = 1.728
regression coefficient b = -0.014
std. error of regression coefficient = 0.003
correlation coefficient = -0.811
std. error of estimate = 0.203

Table 38. Permeability coefficients (K) at 5°C of M. entomon (marinus) at the normal habitat salinity (25‰) (summer, 1976 data).

Animal Length (mm)	Medium dpm	Hemolymph dpm	K
47	59693	33959	1.12
45	60610	29806	0.90
42	60782	35810	1.19
37	62453	34729	1.08
37	61892	34174	1.07
46	60235	29757	0.91
49	62416	33036	1.00
42	58844	30884	0.99
44	59853	32570	1.04
42	61579	26954	0.77
41	62988	37658	1.21
38	63183	35732	1.11
34	61017	38545	1.33
45	61810	32687	1.00
44	60641	32688	1.03

$N = 15$
$\bar{X} = 1.05$
S.D. = 0.14
S.E. = 0.04

Table 39. Permeability coefficients (K) at 5°C of M. entomon (limnos) at the normal habitat salinity (0‰) (summer , 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
46	58012	5543	0.13
49	59162	5334	0.13
42	58977	8737	0.21
41	59877	7066	0.17
42	59753	7592	0.18
42	59835	6752	0.16
44	57611	14187	0.38
46	58012	6410	0.16
47	59124	11030	0.28
46	60563	6876	0.16
43	60848	9564	0.23
39	58785	8395	0.21
40	61081	6405	0.15
41	58687	6508	0.16
40	57750	7723	0.19

N = 15
$\bar{X}$ = 0.19
S.D. = 0.06
S.E. = 0.02

Table 40. Permeability coefficients (K) at 5°C of M. sibirica at the normal habitat salinity (25‰) (summer, 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
69	64785	13118	0.30
57	63554	13841	0.33
59	58436	14511	0.38
62	59535	12282	0.31
49	65883	19162	0.46
62	60682	13370	0.33
50	59997	15702	0.41
55	59728	13379	0.34
69	59319	11127	0.28
64	66814	8822	0.19
67	62733	17867	0.45
59	60418	10138	0.25
66	58563	9541	0.24
40	59150	21771	0.61
49	66221	21016	0.51

$N = 4$
$\bar{X} = 0.49$
S.D. = 0.08
S.E. = 0.04

Table 41. Permeability coefficients (K) at 5°C of M. sabini at the normal habitat salinity (25‰) (summer, 1976 data).

Length	Medium dpm	Hemolymph dpm	K
	60695	17652	0.46
	61628	16580	0.42
	60822	17981	0.47
	65252	23670	0.60

N = 4
$\bar{X}$ = 0.49
S.D. = 0.08
S.E. = 0.04

Table 42. Permeability coefficients (K) of M. entomon (marinus) at 5°C and 10°/₀₀ salinity. Animals acclimated and incubated at 10°/₀₀ (summer, 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
46	59340	11869	0.30
46	60715	9075	0.22
39	61276	13712	0.34
38	61852	15864	0.40
51	57219	9745	0.25
46	65387	11352	0.25
47	58687	11180	0.28
52	58928	11193	0.28
47	56786	11218	0.29
47	60857	14527	0.36
46	59554	11622	0.29
45	61969	12390	0.30
41	57404	9064	0.23
44	57658	12337	0.32
41	57368	10947	0.27

N = 15
$\bar{X}$ = 0.29
S.D. = 0.05
S.E. = 0.01

Table 43. Permeability coefficients (K) of M. entomon (limnos) at 5°C and 10‰ salinity. Animals acclimated and incubated at 10‰ (summer, 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
38	59697	16667	0.44
42	59629	13225	0.33
41	64076	15644	0.37
39	57672	15524	0.42
40	60553	17276	0.45
36	60043	18251	0.48
40	57934	19084	0.53
40	57069	15679	0.43
38	58443	17449	0.47
37	55832	17575	0.50
36	58384	15557	0.41
36	58627	16885	0.45
35	56630	16129	0.45
35	58209	17300	0.47
34	56374	20281	0.59

N = 15
$\bar{X}$ = 0.45
S.D. = 0.06
S.E. = 0.02

Table 44. Permeability coefficients (K) at 5°C of M. entomon (marinus) subjected to osmotic stress. Animals acclimated at 25‰ and incubated at 10‰ (summer, 1976 data).

Length	Medium dpm	Hemolymph dpm	K
48	58612	17937	0.49
56	60928	15715	0.40
46	61177	12634	0.31
61	59910	12954	0.33
52	62656	18711	0.47
46	59949	18666	0.50
45	61709	13858	0.34
44	63362	19957	0.50
53	60570	15254	0.39
44	59565	19363	0.52
45	62968	14754	0.36
42	59456	16263	0.43
41	60863	17503	0.45
42	64319	21581	0.55
54	60283	14633	0.37

N = 15
$\bar{X}$ = 0.43
S.D. = 0.08
S.E. = 0.02

Table 45. Permeability coefficients (K) at 5°C of M. entomon (marinus) subjected to osmotic stress. Animals acclimated at 10‰ and incubated at 0‰ (summer, 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
48	55743	5605	0.14
52	57105	10434	0.27
43	56052	6418	0.16
50	56250	9861	0.26
39	59319	12376	0.31
52	56498	7140	0.18
52	58298	9209	0.23
43	57476	7414	0.18
47	57439	6620	0.16
45	57335	8165	0.21
52	56680	9822	0.25
45	58615	11602	0.29
47	56586	10132	0.25
46	57139	8297	0.21
49	56546	7623	0.19

N = 15
$\bar{X}$ = 0.220
S.D. = 0.05
S.E. = 0.01

Table 46. Permeability coefficients (K) at 5°C of M. entomon (limnos) subjected to osmotic stress. Animals acclimated at 10‰ and incubated at 0‰ (summer, 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
44	54901	10507	0.28
40	57050	5982	0.15
46	56461	5796	0.14
43	59087	11969	0.30
42	58826	10892	0.27
42	59835	6976	0.17
44	58879	8690	0.21
39	58169	8995	0.22
47	56863	8343	0.21
42	58660	5301	0.13
46	58088	8273	0.21
48	58989	7029	0.17
43	59311	7599	0.18
43	57854	7677	0.19
38	57660	8582	0.22

N = 15
$\bar{X}$ = 0.20
S.D. = 0.05
S.E. = 0.01

Table 47. Permeability coefficients (K) at 5°C of M. sibirica subjected to osmotic stress. Animals acclimated at 25°/₀₀ and incubated at 10°/₀₀ (summer, 1976 data).

Length (mm)	Medium dpm	Hemolymph dpm	K
51	59695	15890	0.41
49	58560	10916	0.28
47	61957	12354	0.30
53	63738	15290	0.37
47	59249	13061	0.33
53	59911	12752	0.32
52	59217	13033	0.33
44	59615	12196	0.31
55	63269	11692	0.27
44	62085	12010	0.29
50	60210	13510	0.34
55	58685	6466	0.16
55	59018	10181	0.25
58	61903	9866	0.23

N = 14
$\bar{X}$ = 0.30
S.D. = 0.06
S.E. = 0.02

Table 48. Efflux of tritiated water from M. entomon (marinus) at 5°C. Animals acclimated and incubated at 25°/₀₀ salinity.

Incubation Time (minutes)	Medium dpm No. 1	No. 2	No. 3
10	782	-	-
15	-	824	678
30	1399	1338	1143
45	1703	1712	1510
60	2185	1892	1823
90	2566	2097	2299
120	2880	2210	2575
180	3165	2379	2882
240	3388	2334	3134
300	3376	2403	3207
360	3483		

Table 49. Efflux of tritiated water from M. entomon (marinus). Animals acclimated and incubated at 25°/₀₀ salinity and 5°C. Results expressed as specific activity in incubation medium (dpm/25µl) and as a percentage of the final equilibrium concentration. Time for 50% unloading ($T_{½}$) in minutes (estimated from a probability plot) is indicated.

Incubation Time (mins)	No. 1		No. 2		No. 3		No. 4		No. 5	
	dpm	%	dpm	%	dpm	%	dpm	%	dpm	%
10	782	22.5	-	-	-	-	414	17.3	444	21.3
15	-	-	824	34.3	678	21.1	-	-	-	-
20	-	-	-	-	-	-	738	30.9	748	35.9
30	1399	40.2	1338	55.7	1143	35.6	1015	42.5	955	45.9
40	1703	48.9	-	-	-	-	1230	51.5	1124	54.0
45	-	-	1712	71.2	1510	47.1	-	-	-	-
50	-	-	-	-	-		1400	58.6	1277	61.3
60	2185	62.7	1892	78.7	1823	56.8	1512	63.3	1370	65.8
Equilibrium	3483	100	2403	100	3207	100	2390	100	2082	100
$T_{½}$ (mins)		43.5		25.0		51.0		37.0		41.5

N = 5
$\bar{X}$ = 39.6 mins
S.D. = 9.6 mins
S.E. = 4.3 mins

Table 50. Efflux of tritiated water from M. entomon (marinus). Animals acclimated and incubated at 10‰ salinity and 5°C. Results expressed as in Table 49

Incubation Time (mins)	No. 1 dpm	%	No. 2 dpm	%	No. 3 dpm	%	No. 4 dpm	%	No. 5 dpm	%	No. 6 dpm	%	No. 7 dpm	%
10	-	-	-	-	455	13.9	310	11.6	324	13.0	400	14.6	412	11.5
15	409	14.1	369	18.0	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	575	17.6	406	15.1	452	18.1	638	23.2	618	17.2
30	707	24.4	572	27.2	767	23.5	524	19.6	587	23.5	790	28.7	825	23.0
40	-	-	-	-	777	23.8	600	22.4	682	27.3	1021	37.2	985	27.4
45	988	34.1	787	37.4	-	-	-	-	-	-	-	-	-	-
50	-	-	-	-	910	27.9	721	26.9	794	31.8	1166	42.4	1176	32.8
60	1235	42.6	924	43.9	1091	33.4	780	29.1	885	35.5	1373	50.0	1334	37.2
Equilibrium	2899	100	2106	100	3263	100	2678	100	2495	100	2748	100	3589	100
$T_{½}$ (mins)		71.5		66.0		95.0		91.0		76.0		60.0		73.0

N = 7
$\bar{X}$ = 76.1 min
S.D. = 12.7
S.E. = 4.8

Table 51. Effect of salinity on the permeability coefficient (K) of Mesidotea entomon (marinus) at 5°C. The animals were acclimated at the test salinity prior to incubation in the labelled medium. The radioactivity of the incubation medium and of the hemolymph are indicated (summer 1977 data).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
5	65	23054	3372	0.21
	63	23528	4004	0.25
	59	23178	4094	0.26
	58	23598	3789	0.23
	65	23175	4275	0.27
	63	23857	3486	0.21
	64	23543	3479	0.21
	58	24281	4415	0.27
	70	23534	4029	0.25
	65	23440	3857	0.24
	56	21880	4008	0.27
	59	23349	3883	0.24
			N = 12	
			$\bar{X}$ = 0.24	
			S.D. = 0.0224	
			S.E. = 0.0065	
			C.V. = 9.3%	
10	58	25132	4400	0.26
	58	25465	5290	0.31
	57	24124	4412	0.27
	62	24925	4079	0.24
	54	24328	3674	0.22
	63	23554	4253	0.27
	62	24727	4100	0.24
	65	23967	3584	0.22
	60	23491	4764	0.30
	54	21704	3869	0.26
	61	23605	4215	0.26
	63	22897	4304	0.28
			N = 12	
			$\bar{X}$ = 0.26	
			S.D. = 0.0269	
			S.E. = 0.0078	
			C.V. = 10.3%	

Table 51 (continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	58	24180	4794	0.29
	54	26185	4556	0.25
	57	24347	5560	0.35
	55	24884	4926	0.29
	62	22462	4392	0.29
15	58	25177	5524	0.33
	54	24638	5285	0.32
	59	25209	4508	0.26
	66	24719	4145	0.24
	50	23479	5244	0.34
	56	21202	5149	0.37
	54	23866	4822	0.30
			N = 12	
			$\bar{X}$ = 0.30	
			S.D. = 0.0390	
			S.E. = 0.0112	
			C.V = 13.0	
	64	23375	5032	0.32
	62	25594	6038	0.36
	51	25670	6737	0.41
	61	25294*	5259	0.31
	59	23512	6470	0.43
	54	23902	7752	0.52
20	54	22705*	6506	0.45
	62	25386	5628	0.33
	57	23215	5660	0.37
	62	22424	6290	0.44
	55	23332	4595	0.29
	52	22928	8611	0.63
			N = 12	
			$\bar{X}$ = 0.40	
			S.D. = 0.0940	
			S.E. = 0.0271	
			C.V. = 23.5%	

*Based on one reading rather than average of two readings

Table 51 (continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	60	25847	5260	0.30
	65	24976	6013	0.37
	60	25035	6132	0.37
	62	25741	9601	0.62
25	54	24494	9087	0.62
	68	23594*	7559	0.51
	66	23301	6914	0.47
	60	22949	6484	0.44
	58	23204	9459	0.70
	55	25842	8665	0.54
	61	24928	6668	0.42
			N = 11	
			$\bar{X}$ = 0.49	
			S.D. = 0.1181	
			S.E. = 0.0356	
			C.V. = 24.1%	
	69	24934	9923	0.68
	58	23662	12463	1.00
	55	24641	11826	0.87
	65	23239	13098	1.11
	55	23816	10274	0.75
	54	22749	12159	1.02
	53	24414	12929	1.01
30	61	23329	7846	0.55
	54	24593	10024	0.70
	63	23433	8738	0.62
	59	23731	13551	1.13
	60	23950	10964	0.82
			N = 12	
			$\bar{X}$ = 0.85	
			S.D. = 0.1889	
			S.E. = 0.0545	
			C.V. = 22.2%	

*Based on one reading rather than average of two readings

Table 51 (Continued).

Salinity (‰)	Length (mm)	Medium dpm	Hemolymph dpm	K
	61	24133	13658	1.11
	60	22927	14629	1.36
	58	26730	11512	0.75
	61	25879	15163	1.18
35	57	25108	16242	1.39
	64	26809	13231	0.91
	56	25370	11496	0.80
	70	25631	11347	0.78
	62	23906	10503	0.77
	60	23697	15127	1.36
	60	25744	12651	0.90

N = 11
$\bar{X}$ = 1.03
S.D. = 0.2466
S.E. = 0.0744
C.V. = 23.9%

Table 52. Effects of salinity on the permeability coefficient (K) of Mesidotea entomon (limnos) at 5°C. The animals were acclimated at the test salinity prior to incubation in the labelled medium (summer 1977 data).

Salinity (°/oo)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	51	24024	2375	0.14
	50	24198	1649	0.09
	41	23200	2341	0.14
	50	23251	1630	0.10
0	46	22248	4319	0.29
	40	21832	2143	0.14
	45	24026	3549	0.21
	39	23654	2356	0.14
	48	23620	3221	0.20
	42	23340	2472	0.15
	44	23230*	2071	0.12
	47	22882	2232	0.14
			N = 12	
			$\bar{X}$ = 0.15	
			S.D. = 0.0524	
			S.E. = 0.0151	
			C.V. = 34.9	
	47	23379	6495	0.43
	47	22802	5886	0.40
	44	22535	4134	0.27
	46	23210	5723	0.38
	44	24191	6474	0.42
	44	22656	5707	0.39
5	49	23627	5741	0.37
	46	33007	5525	0.37
	47	23603	5222	0.33
	41	23413	5612	0.37
	45	23246	6557	0.44
	49	23423	5489	0.36
			N = 12	
			$\bar{X}$ = 0.38	
			S.D. = 0.0442	
			S.E. = 0.0128	
			C.V. = 11.6%	

*Based on one reading rather than average of two readings

Table 52 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	42	22146	7525	0.55
	44	23538	6329	0.42
	37	20259	6608	0.53
	37	20011	5683	0.45
10	38	18511	6062	0.53
	40	20958	6975	0.54
	35	22413	8211	0.61
	40	20874	6931	0.54
	37	20297	6750	0.54
	40	19854	5137	0.40
	35	20885*	5419	0.40
	37	22482	6883*	0.49
			N = 12	
			$\bar{X}$ = 0.50	
			S.D. = 0.0647	
			S.E. = 0.0187	
			C.V. = 12.9%	
	42	21805	5935	0.42
	47	21877	4906	0.34
	35	21573	6222	0.45
	39	20779*	6014	0.45
	40	22128	5325	0.37
	41	20493	6200	0.48
15	45	40945	9881	0.37
	44	37467*	10601	0.44
	42	34702	8815	0.39
	43	31939	8598	0.42
	37	28524	8719	0.49
	42	28034	8136	0.46
			N = 12	
			$\bar{X}$ = 0.42	
			S.D. = 0.0452	
			S.E. = 0.0130	
			C.V. = 10.8	

*Based on one reading rather than average of two readings

Table 52 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	42	28286	9230	0.53
	40	28584	8916	0.50
	41	25563	8350	0.53
	40	25667	6734	0.41
20	41	27463	6515	0.36
	42	26671	6452	0.37
	41	28000	6751	0.37
	45	26547	6800	0.39
	46	22887	5650	0.38
	47	26154	7366	0.44
	40	25937	7902	0.48
	38	25583	7506	0.46
			N = 12	
			$\bar{X}$ = 0.43	
			S.D. = 0.0610	
			S.E. = 0.0176	
			C.V. = 14.2%	
	41	25469	9069	0.59
	40	24077	8721	0.60
	38	26151*	9934	0.64
	40	25237	10182	0.69
	38	23953*	8995	0.63
	39	25415*	8619	0.55
25	36	24739	10757	0.76
	40	25073	9253	0.61
	37	25473	10055	0.67
	35	25750	9447	0.61
	40	24141	6113	0.39
			N = 11	
			$\bar{X}$ = 0.61	
			S.D. = 0.0885	
			S.E. = 0.0267	
			C.V. = 14.5%	

*Based on one reading rather than average of two readings

Table 52 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	43	23971	9044	0.63
	41	25132	8562	0.56
	42	21628	7662	0.58
	46	26065	6986	0.42
	49	22866	9604	0.73
30	40	21713	8557	0.67
	42	23306	10323	0.78
	44	23848	8281	0.57
	44	24679	7767	0.50
	42	22465	7663	0.56
			N = 10	
			$\bar{X}$ = 0.60	
			S.D. = 0.1010	
			S.E. = 0.0319	
			C.V. = 16.8%	
	43	27930	2170	0.11
	43	25945	10662	0.71
	46	28615	8458	0.47
	44	25940	1924	0.10
	41	24857	7863	0.51
	42	26627	11075	0.72
	38	25717	9491	0.61
35	45	26614	8249	0.49
	48	25017	8167	0.53
	40	26398	10584	0.68
	41	25668	8012	0.50
	49	25189	7699	0.49
			N = 12	
			$\bar{X}$ = 0.49	
			S.D. = 0.1938	
			S.E. = 0.0559	
			C.V. = 39.6%	

Table 53. Effect of salinity on the permeability coefficient (K) of Mesidotea sibirica at 5°C. The animals were acclimated at the test salinity prior to incubation in the labelled medium (summer 1977 data).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
5	69	24772	3239	0.19
	58	24252	3488	0.21
	58	24364	3834	0.23
	62	20645	2942	0.20
	64	25153	3133	0.18
	58	25099	3439	0.20
	70	24355	4483	0.27
	65	25388	3534	0.20
	59	20122	3113	0.22
	69	25534	3191	0.18
			N = 10	
			$\bar{X}$ = 0.21	
			S.D. = 0.0256	
			S.E. = 0.0081	
			C.V. = 12.2%	
10	69	23830	4490	0.28
	56	24215	4639	0.28
	60	25310	3412	0.19
	64	24188	4145	0.25
	65	27166	4391	0.24
	52	24426	4473	0.27
	53	25284	4392	0.25
	52	26404	4055	0.22
	54	23953	4818	0.30
	68	24409	3623	0.21
	65	25693	3537	0.20
	61	26834	3346	0.18
			N = 12	
			$\bar{X}$ = 0.24	
			S.D. = 0.0375	
			S.E. = 0.0108	
			C.V. = 15.6%	

Table 53 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	60	22940	4948	0.32
	55	25522	3740	0.21
	66	27479	4572	0.24
	69	25786	4714	0.27
	60	23039	4399	0.28
15	65	27530	4239	0.22
	67	28788	4725	0.24
	55	24767	4855	0.29
	71	24083	4256	0.26
	50	24190	5049	0.31
	50	25725	4249	0.24
	51	24175	4972	0.31
			N = 12	
			$\bar{X}$ = 0.27	
			S.D. = 0.0352	
			S.E. = 0.0102	
			C.V. = 13%	
	58	26053	4639	0.26
	61	24231	5727	0.36
	55	26638	4785	0.26
	60	25979	5373	0.31
	57	25332	4752	0.28
20	67	23459	4080	0.25
	57	23575	4963	0.32
	56	23416	4560	0.29
	60	23325	4375	0.28
	57	25065	5134	0.31
	50	23420	4805	0.31
			N = 11	
			$\bar{X}$ = 0.29	
			S.D. = 0.0308	
			S.E. = 0.0093	
			C.V. = 10.6%	

Table 53 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	65	23944	5673	0.36
	63	23550	5996	0.39
	67	25398	5178	0.30
	65	29323	6355	0.33
	54	30701	6378	0.31
25	71	23986*	7132	0.47
	70	23541	4637	0.29
	64	24509	5146	0.31
	65	26024	6992	0.42
	70	26181	6211	0.36
	71	26400	5963	0.34
	68	25267	5075	0.30
			N = 12	
			$\bar{X}$ = 0.35	
			S.D. = 0.0527	
			S.E. = 0.0152	
			C.V. = 15.1%	
	54	24447	9069	0.62
	63	28625	9006	0.50
	62	25922	7319	0.44
	68	27101	8401	0.49
30	55	26757	8185	0.49
	63	27384	7255	0.41
	66	26297	6933	0.41
	64	25337	12271	0.88
	64	27185	10333	0.64
	57	27174	8681	0.51
	56	28956	10720	0.63
	61	25980	8535	0.53
			N = 12	
			$\bar{X}$ = 0.55	
			S.D. = 0.1262	
			S.E. = 0.0364	
			C.V. = 22.9%	

*Based on one reading rather than average of two readings

Table 53. (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	65	26102	10463	0.68
	54	28034	13715	0.90
	66	26753	11274	0.73
	67	29504	7358	0.38
	66	26317	12157	0.83
35	67	26367	6423	0.37
	58	27324	8195	0.48
	70	25941	9518	0.61
	63	24763	9609	0.65
	59	23737	9241	0.66

N = 10
$\bar{X}$ = 0.63
S.D. = 0.1672
S.E. = 0.0529
C.V. = 26.5%

Table 54. Effect of salinity on the permeability coefficient (K) of Mesidotea sabini at 5°C. the animals were acclimated at the test salinity prior to incubation in the labelled medium (summer 1977 data)

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	73	23658	3445	0.21
	62	25203	4197	0.24
	60	24387	3347	0.20
	60	27384*	3847	0.20
	67	26101	3462	0.19
5	66	24993	2914	0.17
	58	25159	3705	0.21
	70	24496	3665	0.22
	63	25881	4490	0.25
	66	25426	3626	0.21
	69	24145	3709	0.22
	70	25672	4019	0.23
			N = 12	
			$\bar{X}$ = 0.21	
			S.D. = 0.0209	
			S.E. = 0.0060	
			C.V. = 10%	
	71	25594	3924	0.22
	63	26743	3874	0.21
	67	16799	4015	0.36
	62	26428	3685	0.20
	61	24196	4867	0.30
	58	23842	3666	0.22
10**	64	23633	4395	0.27
	62	23764	4244	0.26
	64	24202	3800	0.23
	64	25693	4267	0.24
	67	23396	4195	0.26
	60	23985	3427	0.21
			N = 12	
			$\bar{X}$ = 0.25	
			S.D. = 0.0439	
			S.E. = 0.0127	
			C.V. = 17.6%	

* Based on one reading rather than average of two readings

** During acclimation, animals experienced 0°C temperature for about one half day

Table 54 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	62	23638	1859	0.11
	65	25485	4098	0.23
	62	25251	4182	0.24
	70	24547	4553	0.27
	64	24932	4506	0.27
	64	24180	3779	0.23
15	59	25258	3911	0.22
	56	25342	5185	0.31
	64	25090	3728	0.21
	70	28380	4437	0.23
	64	23304	2850	0.17
			N = 11	
			$\bar{X}$ = 0.23	
			S.D. = 0.0505	
			S.E. = 0.0152	
			C.V. = 22%	
	62	21298	5192	0.37
	63	19520	4960	0.39
	72	21438	4003	0.28
	63	24017	4605	0.28
	64	24631	4731	0.28
	60	23919	4864	0.30
20	69	25348	4129	0.24
	72	24583	4556	0.27
	66	24585	3675	0.22
	60	23764	4702	0.29
			N = 10	
			$\bar{X}$ = 0.29	
			S.D. = 0.0496	
			S.E. = 0.0157	
			C.V. = 17.1%	

Table 54 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	71	27456	5283	0.28
	62	26132	3678	0.20
	62	23836	5163	0.33
	59	23686	5762	0.37
	67	27509	4626	0.25
25	62	24644	4661	0.28
	70	25771	4913	0.28
	66	26293	5709	0.33
	64	28499	5180	0.27
	61	25307	4534	0.26
	61	26145	3726	0.20
	63	26814	6160	0.35
			N = 12	
			$\bar{X}$ = 0.28	
			S.D. = 0.0517	
			S.E. = 0.0149	
			C.V. = 18.5%	
	64	25268	4107	0.24
	68	29950	7648	0.39
	59	28854	5932	0.31
	62	28275	5720	0.30
	65	26278	6967	0.41
30	60	25767	5615	0.33
	67	26954	8774	0.53
	65	30391	8063	0.41
	60	28057	5634	0.30
	66	26676	5529	0.31
			N = 10	
			$\bar{X}$ = 0.35	
			S.D. = 0.0786	
			S.E. = 0.0249	
			C.V. = 22.5%	

Table 54 (Continued).

Salinity (‰)	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	62	28935	6472	0.34
	61	27628	7208	0.40
	67	29923	7542	0.39
	62	27454	6254	0.34
35	63	26284	9206	0.57
	64	26886	7923	0.47
	57	26381	7287	0.43
	65	28177	6175	0.33
	69	30554	8632	0.44
	64	26047	6799	0.40
	70	30708	5841	0.28
	67	27177	6793	0.38
			N = 12	
			$\bar{X}$ = 0.40	
			S.D. = 0.0726	
			S.E. = 0.0210	
			C.V. = 18.2%	

Table 55. Effect of temperature on the permeability coefficient (K) of Mesidotea entomon (marinus) at 5‰ salinity. The animals were acclimated at the test temperature prior to incubation in the labelled medium (summer 1977 data).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	58	24013	3259	0.19
	54	23346	3927	0.25
	53	23888	3861	0.24
	58	24153	3518	0.21
	62	24578	2463	0.14
0	60	24078	2841	0.17
	55	23509	3924	0.24
	64	24022	2687	0.16
	55	24280	2925	0.17
	52	23717	4327	0.27
	56	24334	3459	0.20
	57	23707	3191	0.19
			N = 12	
			$\bar{X}$ = 0.20	
			S.D. = 0.0385	
			S.E. = 0.0111	
			C.V. = 19.3%	
	65	23054	3372	0.21
	63	23528	4004	0.25
	59	23178	4094	0.26
	58	23598	3789	0.23
	65	23175	4275	0.27
	63	23857	3486	0.21
5	64	23543	3479	0.21
	58	24281	4415	0.27
	70	23534	4029	0.25
	65	23440	3857	0.24
	56	21880	4008	0.27
	59	23349	3883	0.24
			N = 12	
			$\bar{X}$ = 0.24	
			S.D. = 0.0224	
			S.E. = 0.0065	
			C.V. = 9.3%	

Table 55 (Continued).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	60	22967	4902	0.32
	55	24750	6142	0.38
	51	26504	6813	0.40
	61	28019	5615	0.30
10	58	24449	5035	0.31
	60	23685	5871	0.38
	55	24986	5166	0.31
	65	27011	6757	0.38
	52	28046	7954	0.44
	56	24863	5493	0.33
	58	24763	5375	0.33
			N = 11	
			$\bar{X}$ = 0.35	
			S.D. = 0.0433	
			S.E. = 0.0131	
			C.V. = 12.4%	
	67	23105	5313	0.35
	64	24097	6567	0.42
	59	22829	6973	0.49
	62	23136	5744	0.38
15	62	24029	5706	0.36
	63	22823	6003	0.41
	68	25281	5558	0.33
	66	23583	5441	0.35
	65	20906	6007	0.45
	60	22634	6267	0.43
			N = 10	
			$\bar{X}$ = 0.40	
			S.D. = 0.0488	
			S.E. = 0.0154	
			C.V. = 12.2%	

Table 56. Effect of temperature on the permeability coefficient (K) of Mesidotea entomon (marinus) at 25‰ salinity. The animals were acclimated at the test temperature prior to incubation in the labelled medium (summer 1977 data).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	62	25234	10977	0.76
	65	26991	8550	0.51
	65	26025	9539	0.61
	60	27627	14996	1.04
	63	25577	8771	0.56
0	58	27604	11448	0.71
	57	25735	11009	0.74
	62	28840	11062	0.65
	66	25711	10487	0.70
	63	25884	10185	0.67
	60	27743	6009	0.33
	62	25996	9583	0.61
			N = 12	
			$\bar{X}$ = 0.66	
			S.D. = 0.1611	
			S.E. = 0.0465	
			C.V. = 24.4%	
	60	25847	5260	0.30
	65	24976	6013	0.37
	60	25035	6132	0.37
	62	25741	9601	0.62
5	54	24494	9087	0.62
	68	23594*	7559	0.51
	66	23301	6914	0.47
	60	22949	6484	0.44
	58	23204	9459	0.70
	55	25842	8665	0.54
	61	24928	6668	0.42
			N = 11	
			$\bar{X}$ = 0.49	
			S.D. = 0.1181	
			S.E. = 0.0356	
			C.V. = 24.1%	

*Based on one reading rather than the average of two readings

Table 56 (Continued).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
10	53	26761	20142	1.86
	62	27130	18106	1.47
	59	26545	11565	0.76
	62	27396	19280	1.62
	63	24797	18198	1.77
	62	27594	16024	1.16
	65	25548	16830	1.43
	61	21183	18192	2.61
	64	26332	16832	1.36
	57	26225	17026	1.40
	58	25690	18077	1.62
			N = 11	
			$\bar{X}$ = 1.55	
			S.D. = 0.4404	
			S.E. = 0.1328	
			C.V. = 28.4%	
15	64	25487	17338	1.52
	60	27971	17533	1.31
	68	27290	14461	1.01
	58	25771	20308	2.07
	66	27941	18146	1.40
	54	26534	17897	1.50
	57	30300	18869	1.30
	64	26408	19202	1.73
	69	27694	19189	1.57
	65	26836	15217	1.12
	66	26176	17061	1.41
	66	26353	15524	1.19
			N = 12	
			X = 1.43	
			S.D. = 0.2731	
			S.E. = 0.0788	
			C.V. = 19.1%	

Table 57. Effect of temperature on the permeability coefficient (K) of Mesidotea entomon (limnos) at 0°/₀₀ salinity. The animals were acclimated at the test temperature prior to incubation in the labelled medium (summer 1977 data).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	46	23564	1588	0.09
	45	23892	1907	0.11
	51	24074	1734	0.10
	47	24977	1641	0.09
	48	24640	1888	0.11
0	45	27003	2114	0.11
	46	24282	2068	0.12
	43	19050	2057	0.15
	43	28433	2229	0.11
	40	25644	2051	0.11
	42	24596	1623	0.09
	39	25346	2072	0.11
			N = 12	
			$\bar{X}$ = 0.11	
			S.D. = 0.0157	
			S.E. = 0.0045	
			C.V. = 14.3%	
	51	24024	2375	0.14
	50	24198	1649	0.09
	41	23200	2341	0.14
	50	23251	1630	0.10
	46	22248	4319	0.29
5	40	21832	2143	0.14
	45	24026	3549	0.21
	39	23654	2356	0.14
	48	23620	3221	0.20
	42	23340	2472	0.15
	44	23230*	2071	0.12
	47	22882	2232	0.14
			N = 12	
			$\bar{X}$ = 0.15	
			S.D. = 0.0524	
			S.E. = 0.0151	
			C.V. = 34.9%	

*Based on one reading rather than average of two readings

Table 57 (Continued).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	46	24329	4604	0.28
	46	24654	3990	0.24
	49	24862	5250	0.32
	49	23850	5021	0.32
	49	25228	4201	0.24
10	50	24361	3854	0.23
	40	23726	3839	0.24
	48	24234	3542	0.21
	46	24354	6208	0.39
	47	24745	5490	0.33
	40	25310	3966	0.23
	47	24145	3900	0.23
			N = 12	
			$\bar{X}$ = 0.27	
			S.D. = 0.0534	
			S.E. = 0.0154	
			C.V. = 19.8%	
	47	24588	5594	0.34
	50	24138	5158	0.32
	48	24372	5429	0.34
	43	24522	7695	0.50
	47	24556	5776	0.31
	45	23343	5881	0.39
15	48	23282	6428	0.43
	43	23649	6877	0.46
	41	23086	4701	0.30
	46	24062	5144	0.32
	46	23335	5286	0.34
	42	22858	4733	0.31
			N = 12	
			$\bar{X}$ = 0.36	
			S.D. = 0.0634	
			S.E. = 0.0183	
			C.V. = 17.6%	

Table 58. Effect of temperature on the permeability coefficient (K) of Mesidotea sibirica at 25‰ salinity. The animals were acclimated at the test temperature prior to incubation in the labelled medium (summer 1977 data).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
0	64	25465	4403	0.25
	65	27730	4096	0.21
	64	25836	3835	0.21
	56	27171	5545	0.30
	60	26103	4057	0.23
	57	24393	4262	0.26
	64	27679*	4406	0.23
	65	24352	4461	0.27
	63	27097	4067	0.22
	59	26139	5022	0.28
	64	26597	5424	0.30
	65	25920	3878	0.22
			N = 12	
			$\bar{X}$ = 0.25	
			S.D. = 0.0318	
			S.E. = 0.0092	
			C.V. = 12.7%	
5	65	23944	5673	0.36
	63	23550	5996	0.39
	67	25398	5178	0.30
	65	29323	6355	0.33
	54	30701	6378	0.31
	71	23986*	7132	0.47
	70	23541	4637	0.29
	64	24509	5146	0.31
	65	26024	6992	0.42
	70	26181	6211	0.36
	71	26400	5963	0.34
	68	25267	5075	0.30
			N = 12	
			$\bar{X}$ = 0.35	
			S.D. = 0.0527	
			S.E. = 0.0152	
			C.V. = 15.1%	

*Based on one reading rather than average of two readings

Table 58 (Continued).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	53	26573	9384	0.58
	60	25432	13492	1.01
	58	30052	13713	0.81
	62	26223	12154	0.83
	67	24500	11776	0.87
10	58	27796	6656	0.36
	52	26095	10656	0.70
	57	27662	9746	0.58
	71	25461	7203	0.44
	54	25957	12670	0.89
	49	27663	7678	0.43
	49	27200	9336	0.56

N = 12
X = 0.67
S.D. = 0.2010
S.E. = 0.0580
C.V. = 30%

Table 59. Effect of temperature on the permeability coefficient (K) of *Mesidotea sabini* at 25‰ salinity. The animals were acclimated at the test temperature prior to incubation in the labelled medium (summer 1977 data).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
0	70	26535	3715	0.19
	61	26275	3898	0.21
	69	26646	4340	0.24
	64	25700	3633	0.20
	68	24530	4610	0.28
	56	27115	3717	0.20
	64	25031	3710	0.21
	66	25387	3804	0.22
	61	26366	3537	0.19
	60	25899	3717	0.21
	61	26317	3302	0.18
	58	24637	3369	0.20
			$N = 12$	
			$\bar{X} = 0.21$	
			S.D. = 0.0256	
			S.E. = 0.0074	
			C.V. = 12.2%	
5	71	27456	5283	0.28
	62	26132	3678	0.20
	62	23836	5163	0.33
	59	23686	5762	0.37
	67	27509	4626	0.25
	62	24644	4661	0.28
	70	25771	4913	0.28
	66	26293	5709	0.33
	64	28499	5180	0.27
	61	25307	4534	0.26
	61	26145	3726	0.20
	63	26814	6160	0.35
			$N = 12$	
			$\bar{X} = 0.28$	
			S.D. = 0.0517	
			S.E. = 0.0149	
			C.V. = 18.5%	

Table 59 (Continued).

Temperature °C	Animal Length (mm)	Medium dpm	Hemolymph dpm	K
	69	28872	8849	0.49
	73	27441	8507	0.49
	62	26798	5452	0.30
10	57	27593	5757	0.31
	70	27621	6877	0.38
	59	24363	6439	0.41
	66	25604	5831	0.34
	65	26208	8450	0.52

$N = 8$
$\bar{X} = 0.40$
S.D. = 0.0811
S.E. = 0.0287
C.V. = 20.3%

Table 60. Statistical significance of differences in mean permeability coefficients (K) of various *Mesidotea* species exposed to different salinities at 5°C. Mean permeability coefficients at adjacent salinities are compared by the "Student's" t test. t - values, degrees of freedom (d.f.) and probabilities (p) are indicated.

Salinities Compared °/oo	*M. entomon* (*marinus*) t	d.f.	p	*M. entomon* (*limnos*) t	d.f.	p	*M. sibirica* t	d.f.	p	*M. sabini* t	d.f.	p
0:5				10.77	22	0.005						
5:10	1.74	22	0.10	5.19	22	0.005	2.13	20	0.01	2.44	22	0.01
10:15	2.91	22	0.005	3.22	22	0.005	1.72	22	0.05	1.07	21	0.10
15:20	3.34	22	0.005	0.51	22	0.40	1.92	21	0.025	2.85	19	0.005
20:25	1.77	21	0.05	5.39	21	0.005	2.87	21	0.005	0.38	20	0.30
25:30	5.29	21	0.005	0.29	19	0.30	4.79	22	0.005	2.37	20	0.01
30:35	1.82	21	0.05	1.50	20	0.05	1.27	20	0.10	1.31	20	0.05

Table 61. Statistical significance of differences in mean permeability coefficients (K) of various Mesidotea species exposed to different temperatures. Mean permeability coefficients at adjacent temperatures are compared by the "Student's" t test. t - values, degrees of freedom (d.f.) and probabilities (p) are indicated.

Temperatures Compared °C	M. entomon (marinus) (5‰)			M. entomon (marinus) (25‰)			M. entomon (limnos) (0‰)			M. sibirica (25‰)			M. sabini (25‰)		
	t	d.f.	p	t	d.f.	p	t	d.f.	p	t	d.f.	p	t	d.f.	p
0:5	2.98	22	0.005	2.74	21	0.005	2.83	22	0.005	5.38	22	0.005	4.17	22	0.005
5:10	7.41	21	0.005	7.38	20	0.005	5.18	22	0.005	5.16	22	0.005	3.88	18	0.005
10:15	2.10	19	0.01	0.78	21	0.20	3.67	22	0.005						

Table 62. Statistical significance of differences in mean permeability coefficients (K) of different Mesidotea species at different salinities at 5°C. Mean permeability coefficients of the different species at each exposure temperature are compared by the "Student's" t test. t - values, degrees of freedom (d.f.) and probabilities (p) are indicated.

Salinity (‰)	M. entomon (marinus) M. entomon (limnos)			M. entomon (marinus) M. sibirica			M. entomon (marinus) M. sabini		
	t	d.f.	p	t	d.f.	p	t	d.f.	p
5	9.04	22	0.005	3.21	20	0.005	3.25	22	0.005
10	11.32	22	0.005	1.56	22	0.1	0.81	22	0.25
15	6.72	22	0.005	2.32	22	0.025	3.89	21	0.005
20	0.89	22	0.20	3.58	21	0.005	3.27	20	0.005
25	2.69	20	0.01	3.53	21	0.005	5.20	21	0.005
30	3.66	20	0.005	4.51	22	0.005	7.49	20	0.005
35	5.55	21	0.005	4.09	19	0.005	8.09	21	0.005

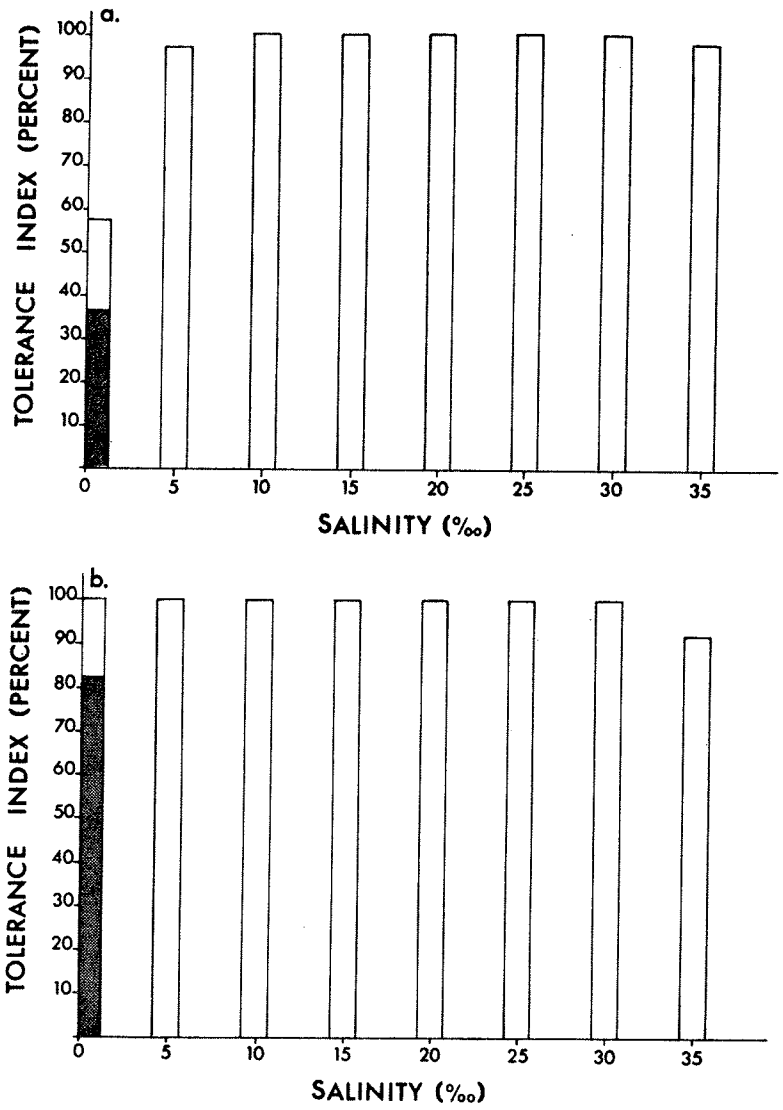

Figure 1. Tolerance of a) M. entomon (marinus) and b) M. entomon (limnos) to different salinities between 0‰ and 35‰ during 10 days exposure at 0° ± 1°C. N = 10 in each exposure group. Dark portion of 0‰ bar indicates survival in distilled water and light portion survival in lakewater.

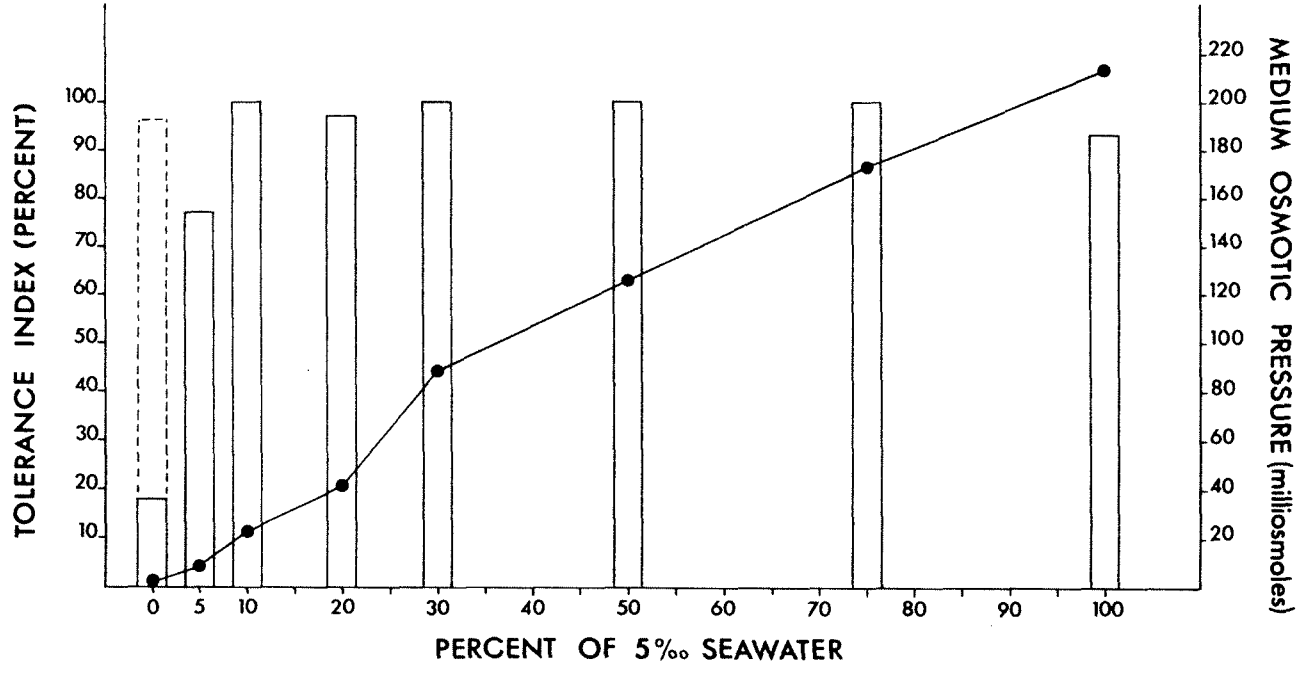

Figure 2. Tolerance of adult M. entomon (marinus) to different dilutions of 5‰ seawater during 15 days exposure at 0° ± 1°C. N = 10 in each exposure group. Tolerance index indicated by bars of histogram. Points joined by the solid lines indicate the osmotic pressure of the medium at each dilution tested. The broken lines in the 0‰ bar of histogram indicate the tolerance index for M. entomon (limnos) exposed to the same experimental conditions.

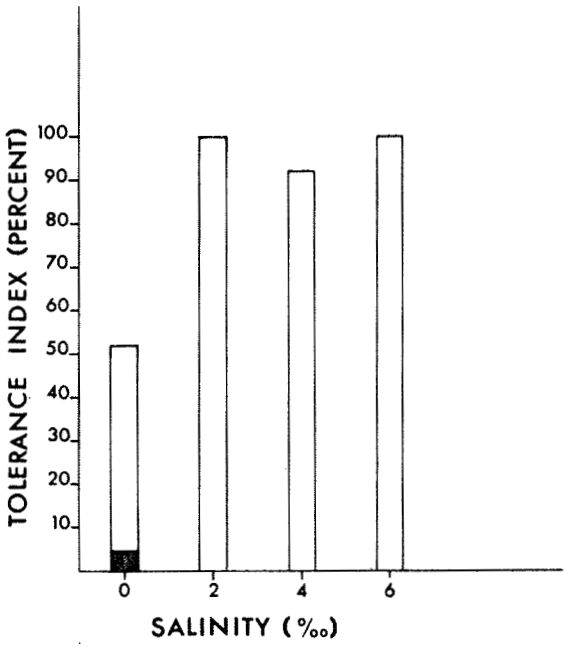

Figure 3. Tolerance of juvenile M. entomon (marinus) to different salinities between 0‰ and 6‰ during 9 days of exposure. Animals released from brood pouch 3-5 days prior to exposure. N = 10 in each exposure group. Dark portion of 0‰ bar indicates survival of animals exposed to distilled water, and light portion survival in lakewater.

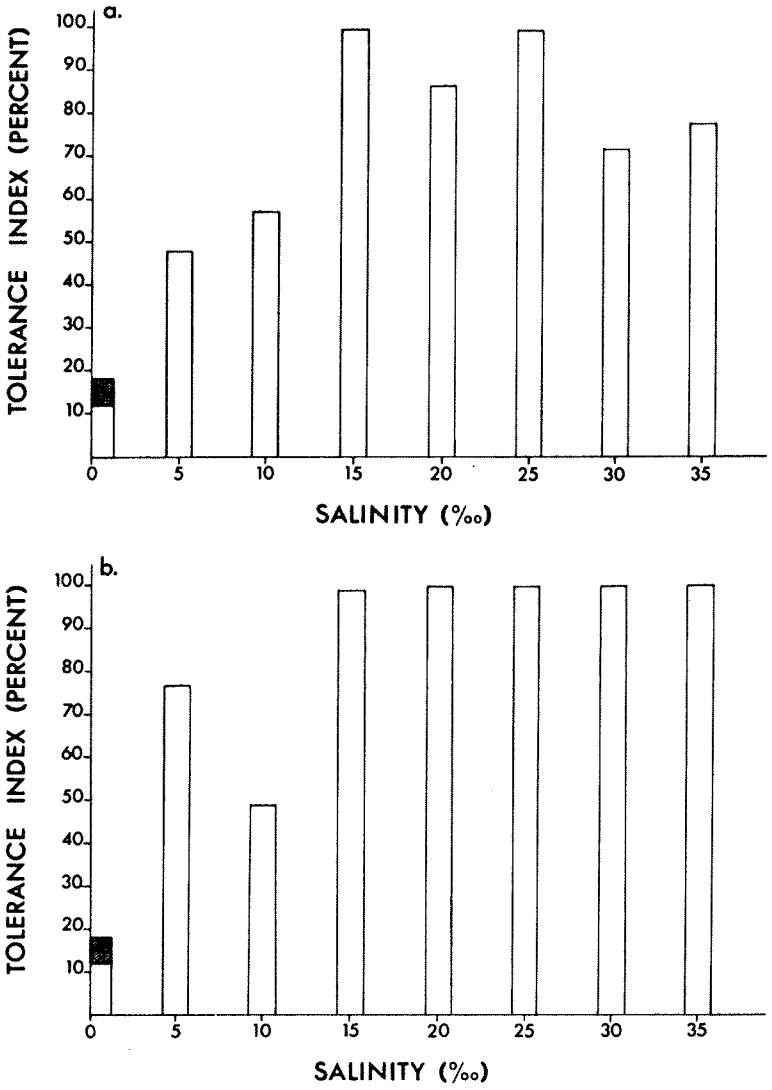

Figure 4. Tolerance of a) M. sabini and b) M. sibirica to different salinities between 0‰ and 35‰ during 10 days exposure at 0° ± 1°C. N = 10 in each exposure group. Dark portion of 0‰ bar indicates survival of animals exposed to distilled water and light portion survival in lakewater.

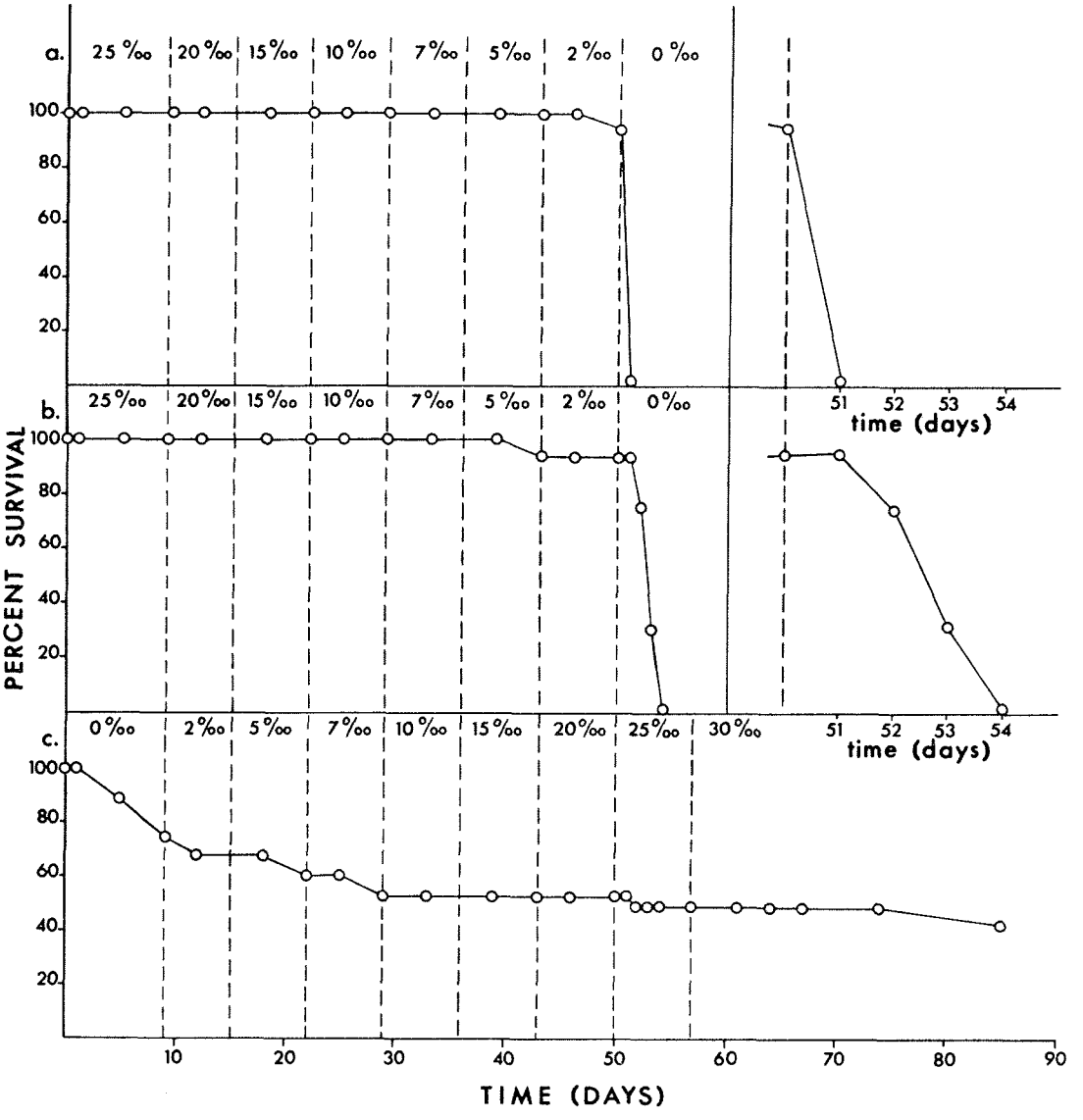

Figure 5. Survival during cross-acclimation of a) M. sibirica and b) M. entomon (marinus) from seawater (25‰) to freshwater, and of c) M. entomon (limnos) from freshwater to seawater at 5° ± 1°C. N = 16 for each exposure group. Right-hand extremities of graphs a) and b) repeated on an expanded time scale to emphasize differences in mortality rates following transfer to freshwater.

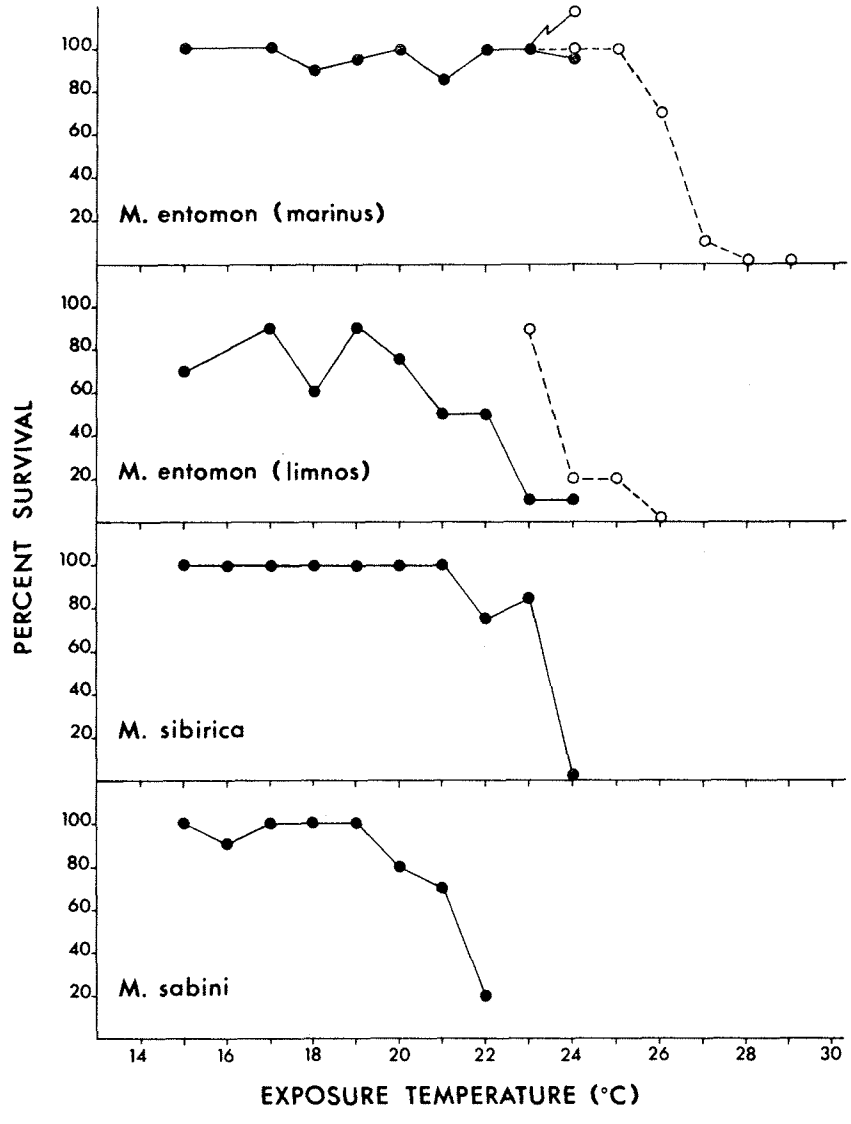

Figure 6. Temperature tolerances of M. entomon (marinus), M. entomon (limnos), M. sibirica and M. sabini during 96 hours exposure. Closed circles and solid lines represent results of 1975 series while open circles and broken lines indicate results of 1976 series.

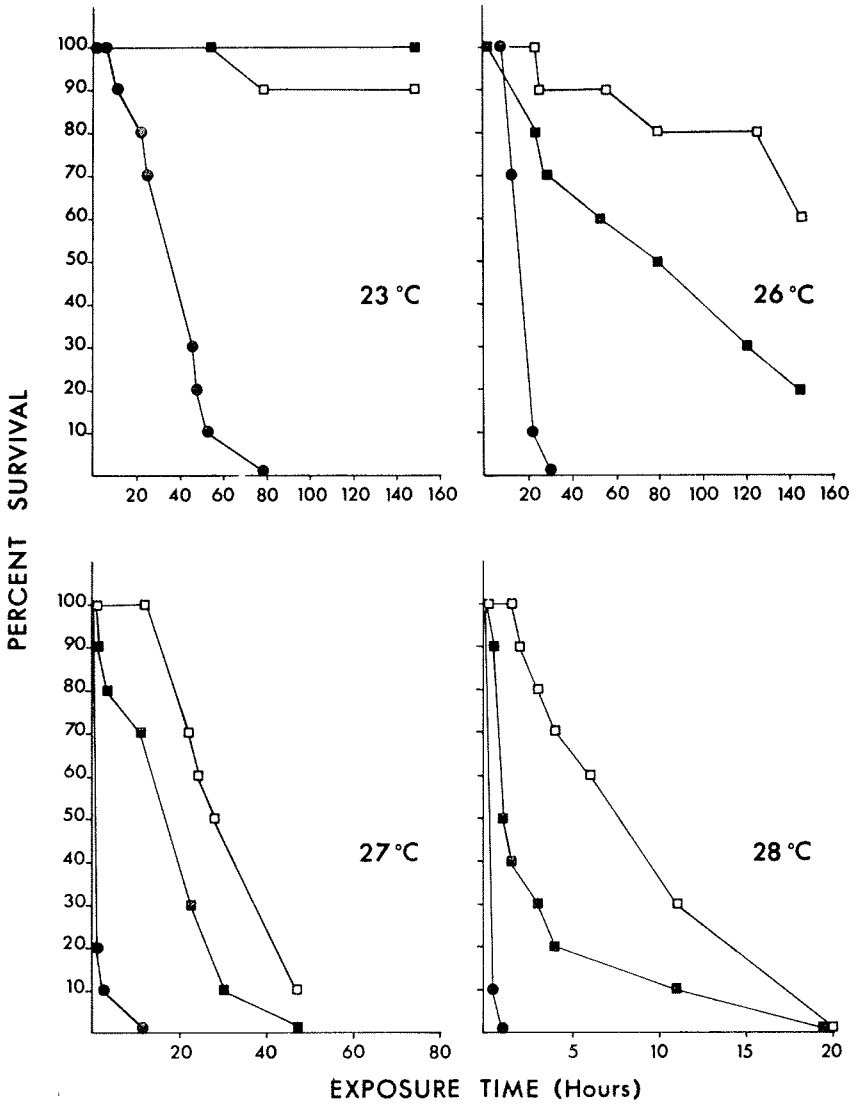

Figure 7. Effect of salinity upon the temperature tolerance of M. entomon (limnos) during 96 hours exposure. N = 10 in each exposure group. Animals acclimated and tested at the following salinities: solid circles, 0‰; solid squares, 5‰; open squares, 10‰. Exposure temperatures indicated on each graph.

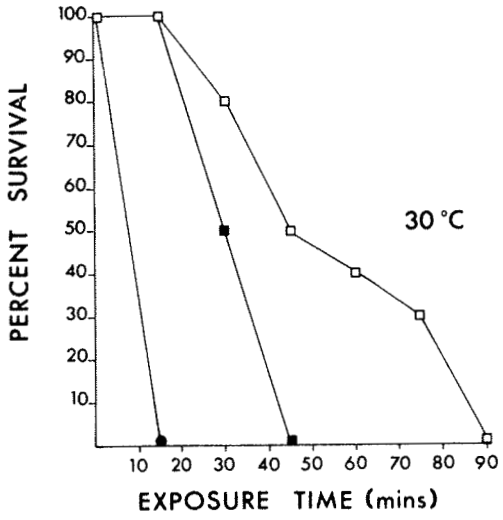

Figure 8. Effect of salinity upon the temperature tolerance of M. entomon (limnos). Refer to legend of figure 7 for explanation of symbols.

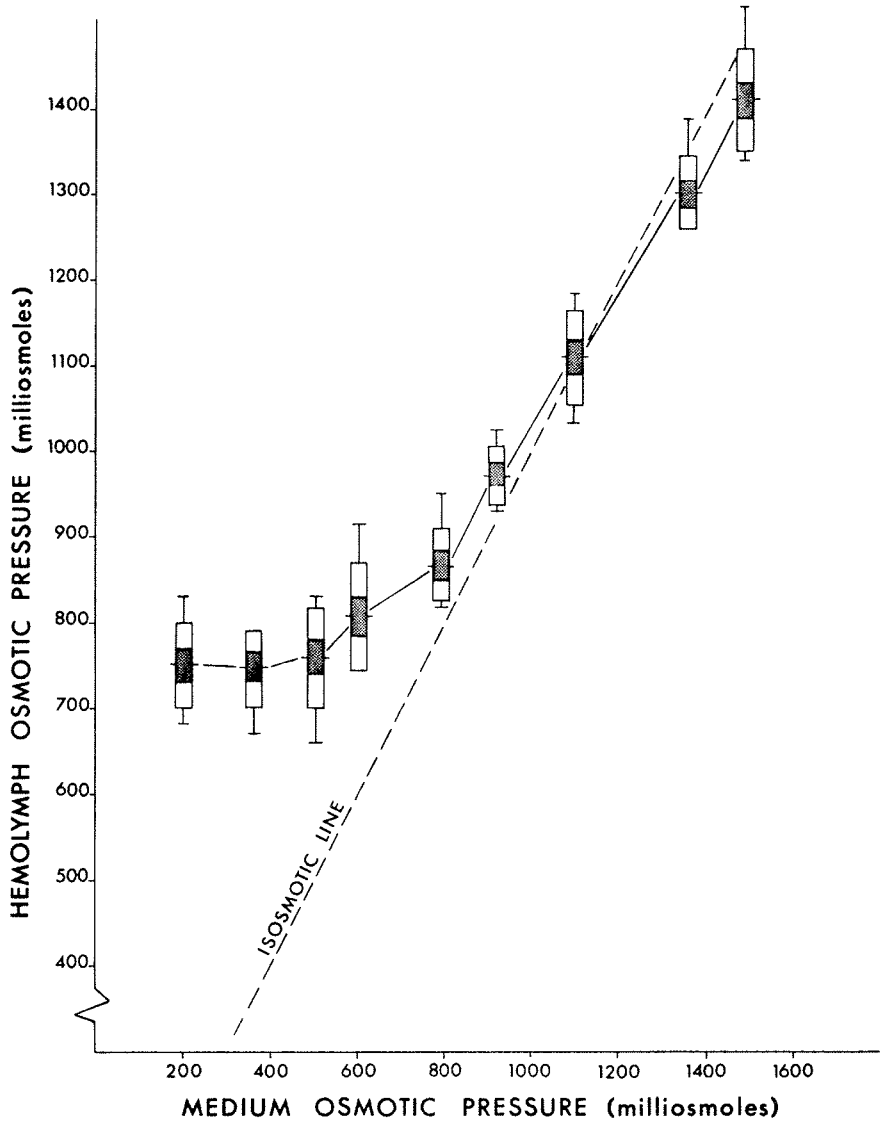

Figure 9. Osmotic pressure of hemolymph of M. entomon (marinus) following acclimation to different salinities between 5‰ and 45‰ at 5°C. Horizontal lines indicate mean values, dark rectangles indicate standard errors of the means, white rectangles indicate standard deviations and vertical lines indicate the ranges of the observations.

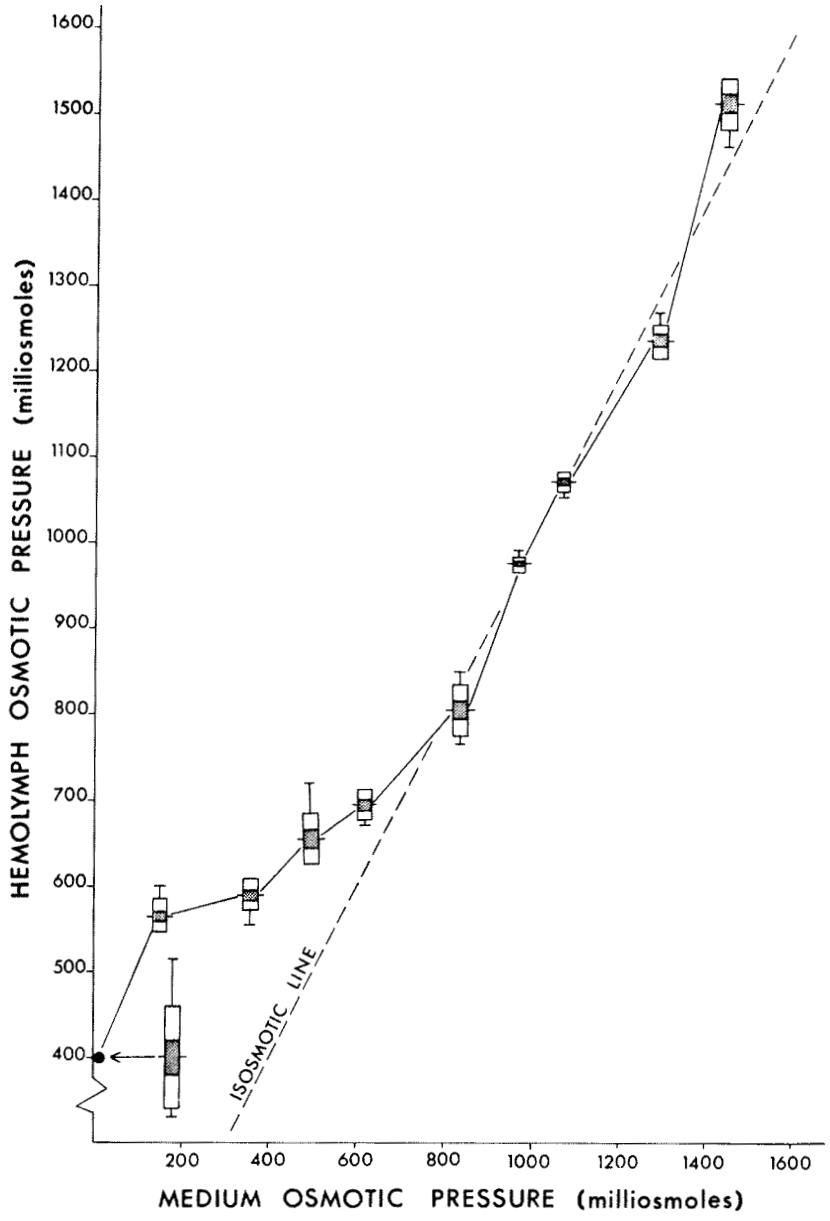

Figure 10. Osmotic pressure of hemolymph of M. entomon (limnos) following acclimation to different salinities between 0‰ and 45‰ at 5°C. Refer to legend of figure 9 for explanation of symbols.

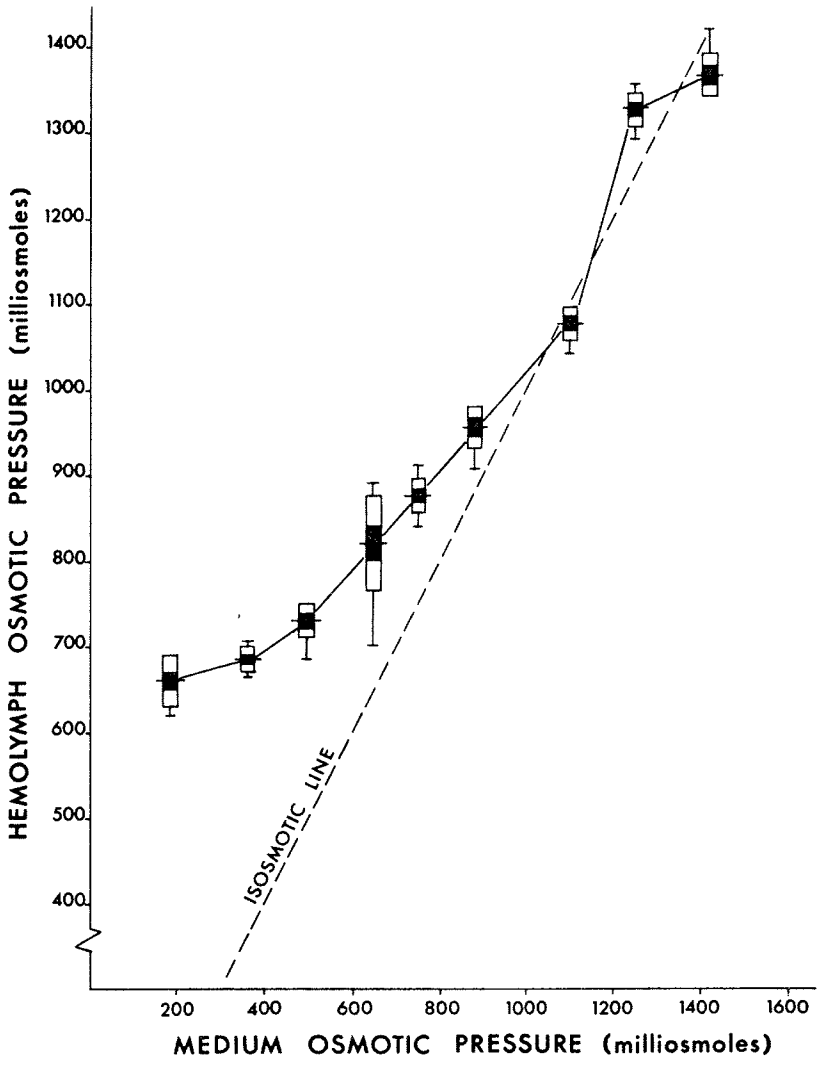

Figure 11. Osmotic pressure of hemolymph of M. sibirica following acclimation to different salinities between 5‰ and 45‰ at 5°C. Refer to legend of figure 9 for explanation of symbols.

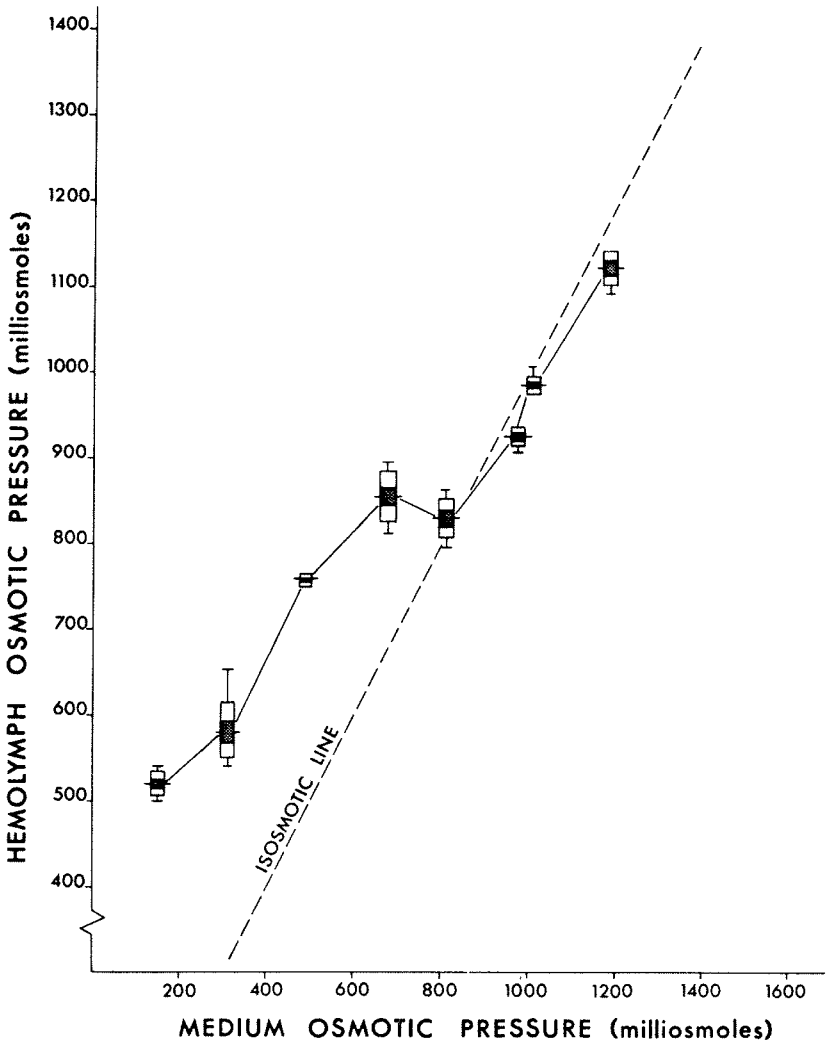

Figure 12. Osmotic pressure of hemolymph of M. sabini following acclimation to different salinities between 5‰ and 40‰ at 5°C. Refer to legend of figure 9 for explanation of symbols.

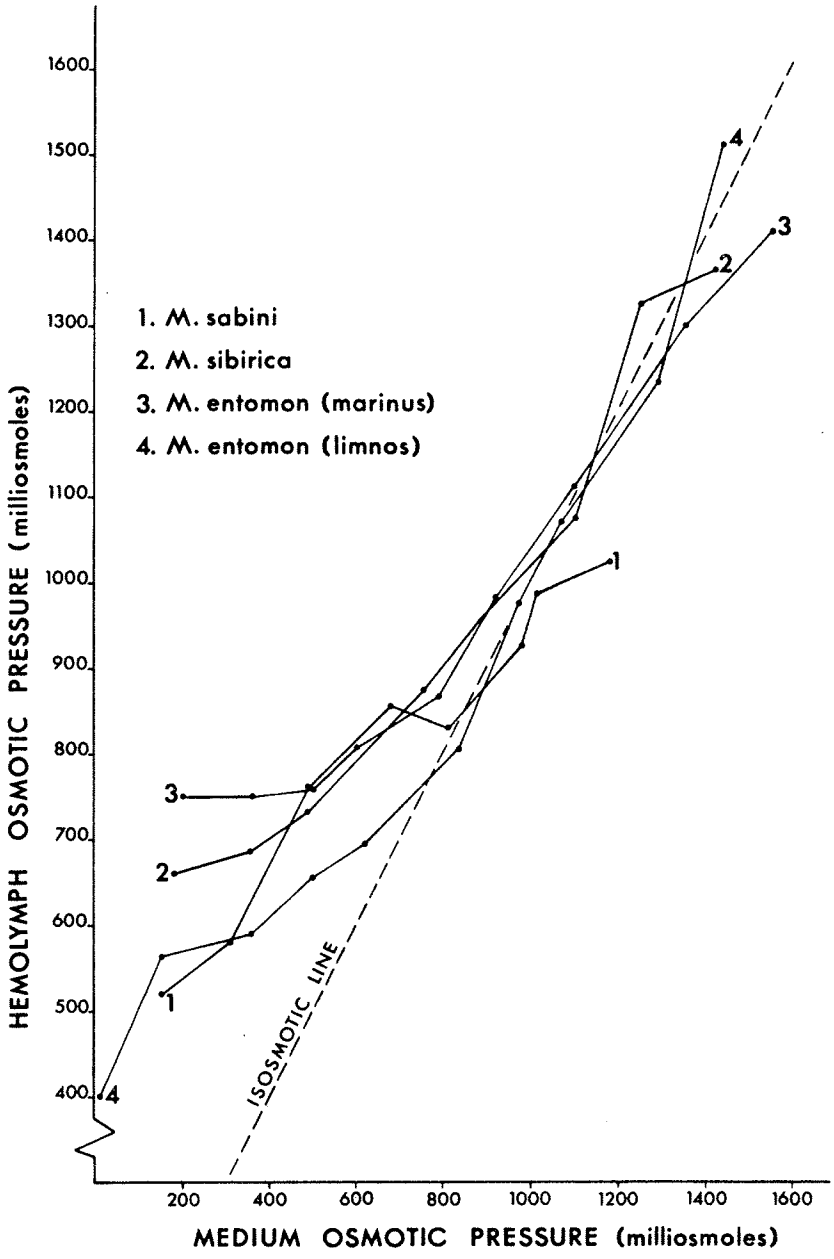

Figure 13. Comparison of osmotic pressures of hemolymph of M. sabini, M. sibirica, M. entomon (marinus) and M. entomon (limnos) following acclimation to different salinities between 0‰ and 45‰ at 5°C.

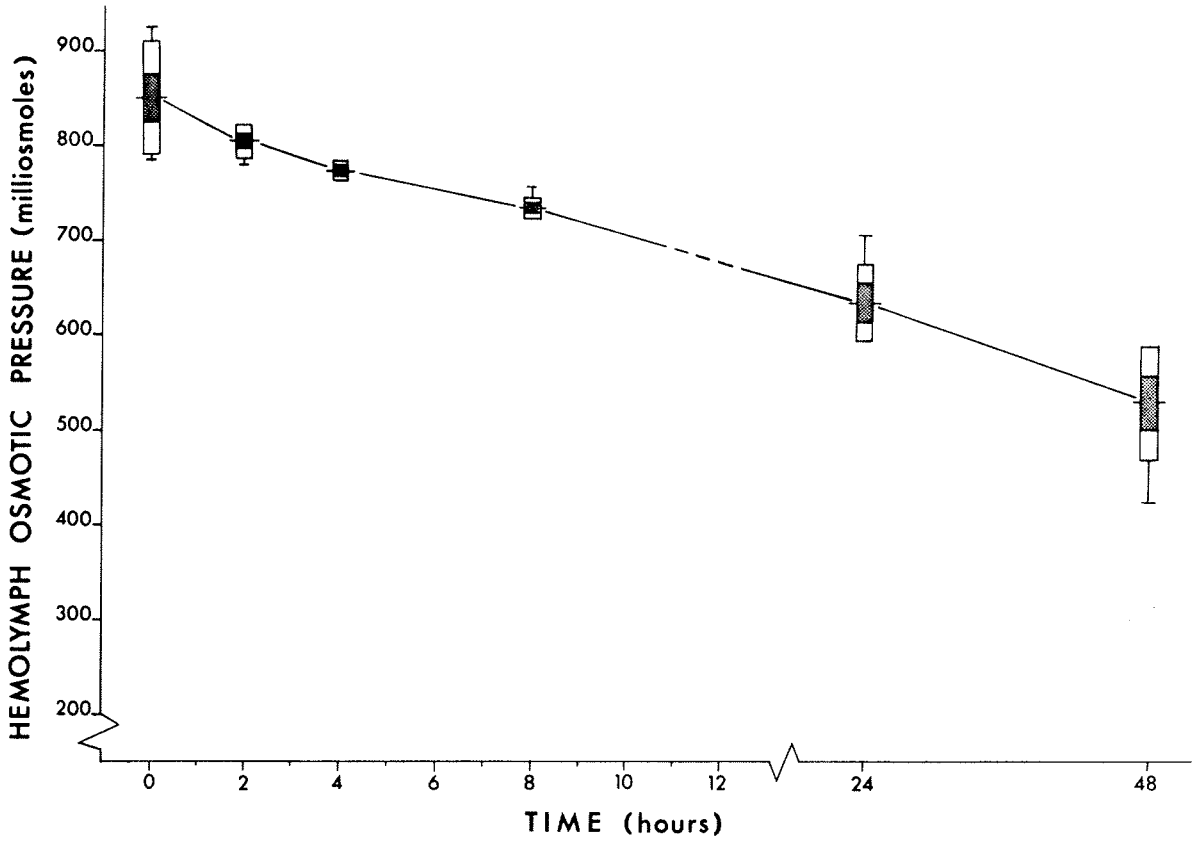

Figure 14. Rate of decline of hemolymph osmotic pressure in M. entomon (marinus) for 48 hours following transfer to freshwater from 25‰ seawater.

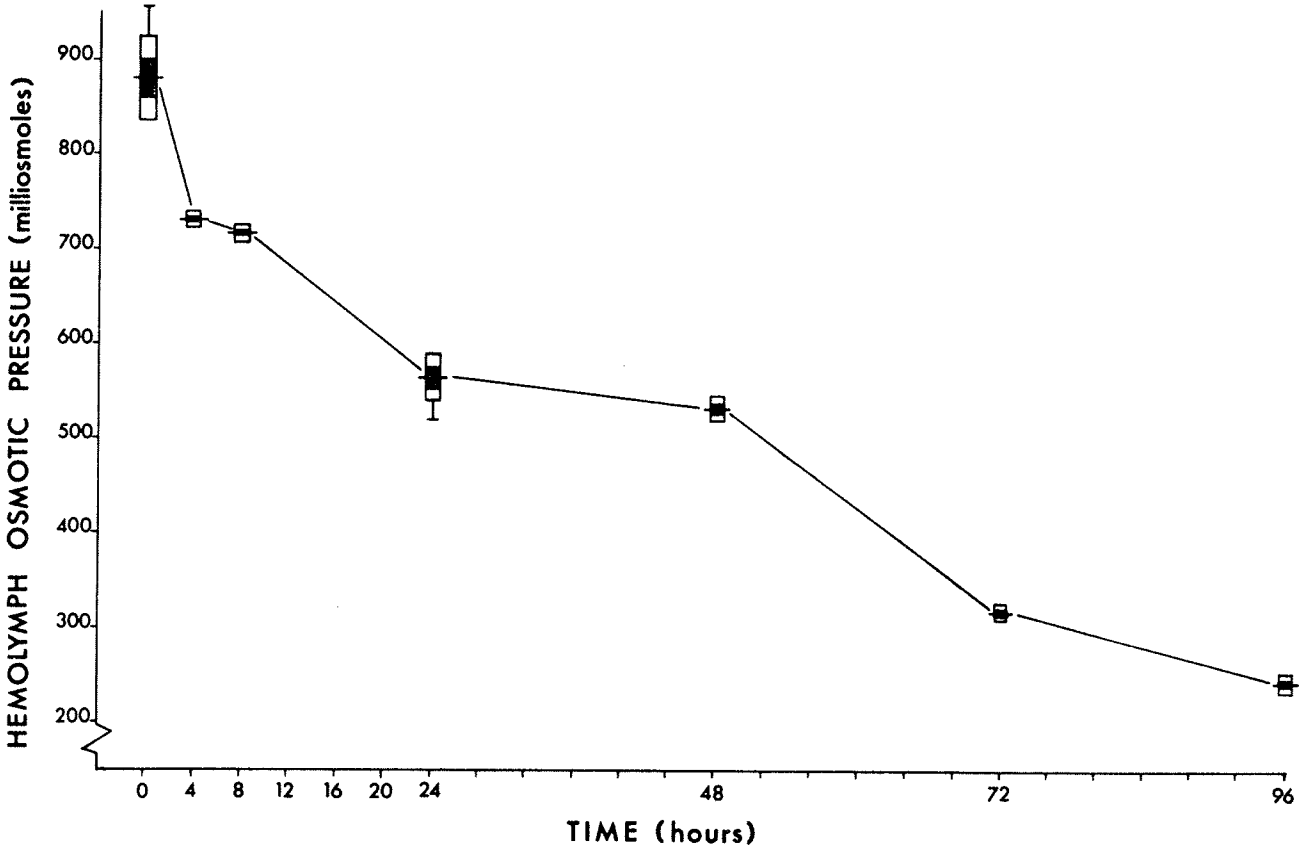

Figure 15. Rate of decline of hemolymph osmotic pressure in M. entomon (marinus) for 96 hours following transfer to freshwater from 25‰ seawater.

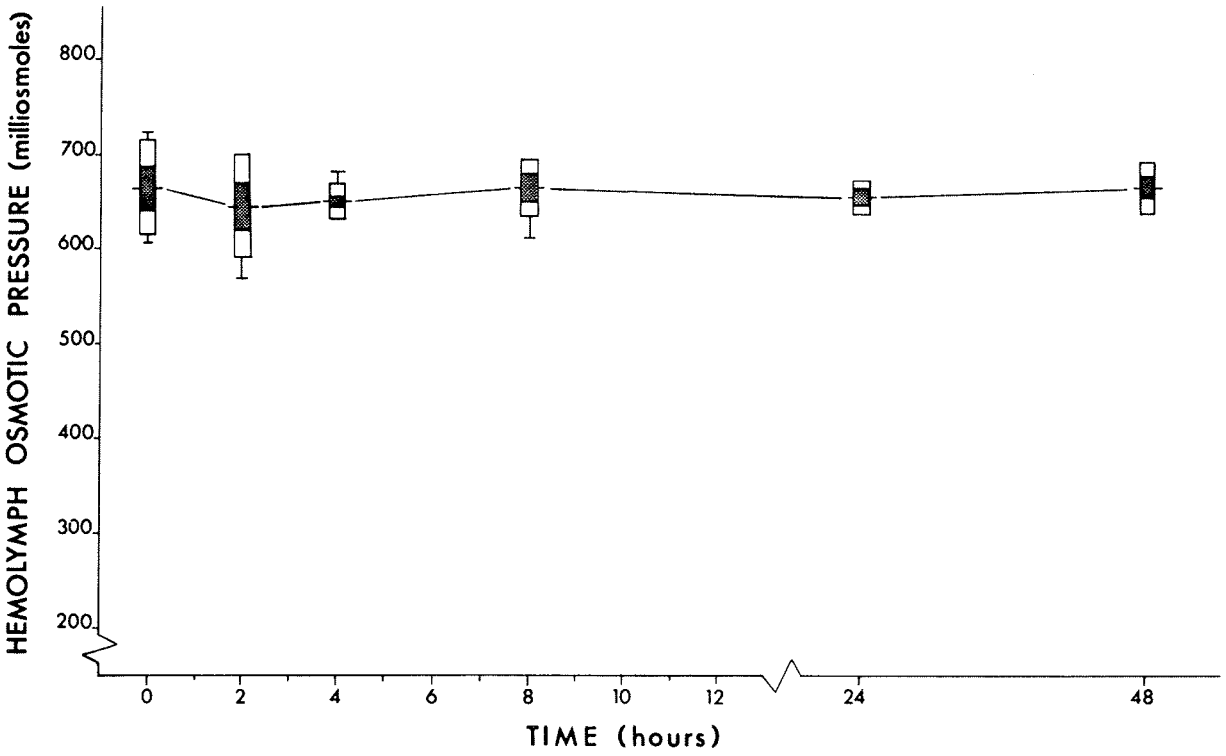

Figure 16. Rate of decline of hemolymph osmotic pressure in M. entomon (limnos) during 48 hours exposure in freshwater.

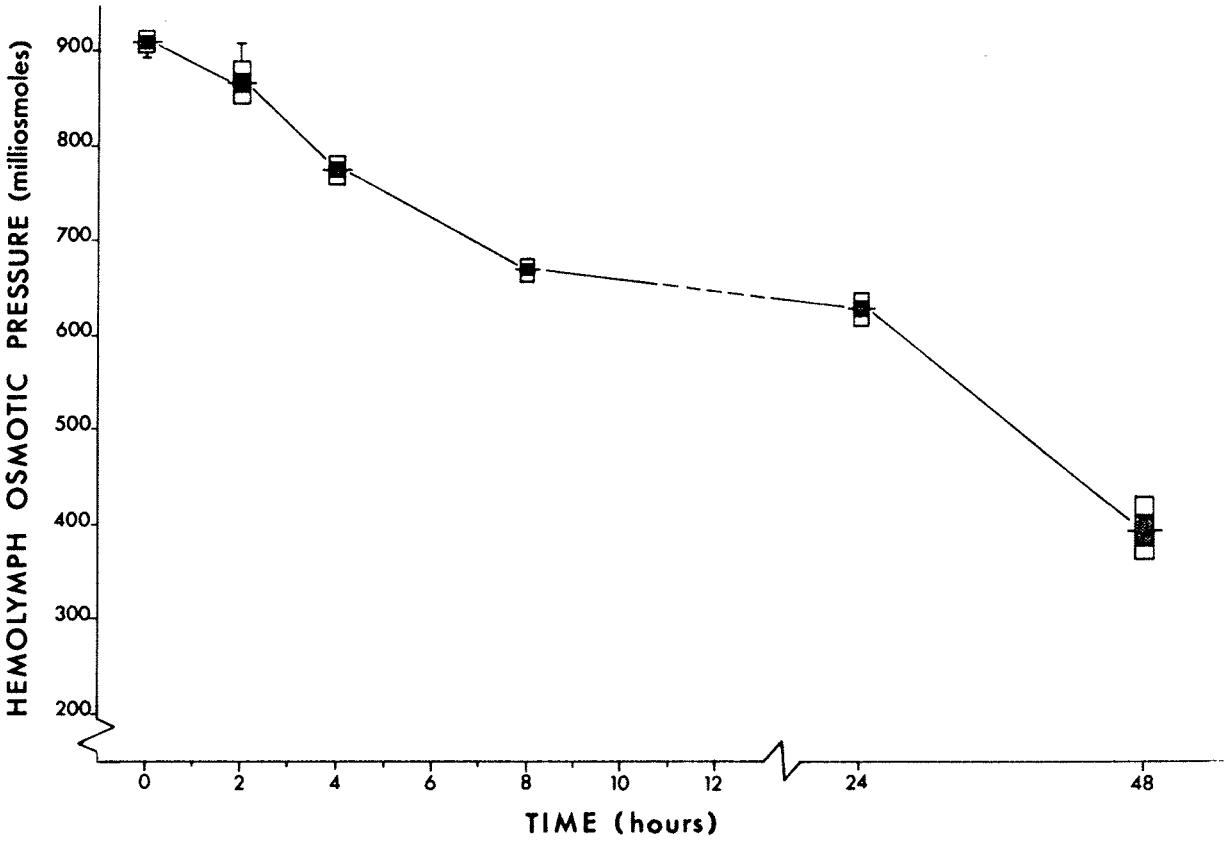

Figure 17. Rate of decline of hemolymph osmotic pressure in M. sibirica for 48 hours following transfer to freshwater from 25‰ seawater.

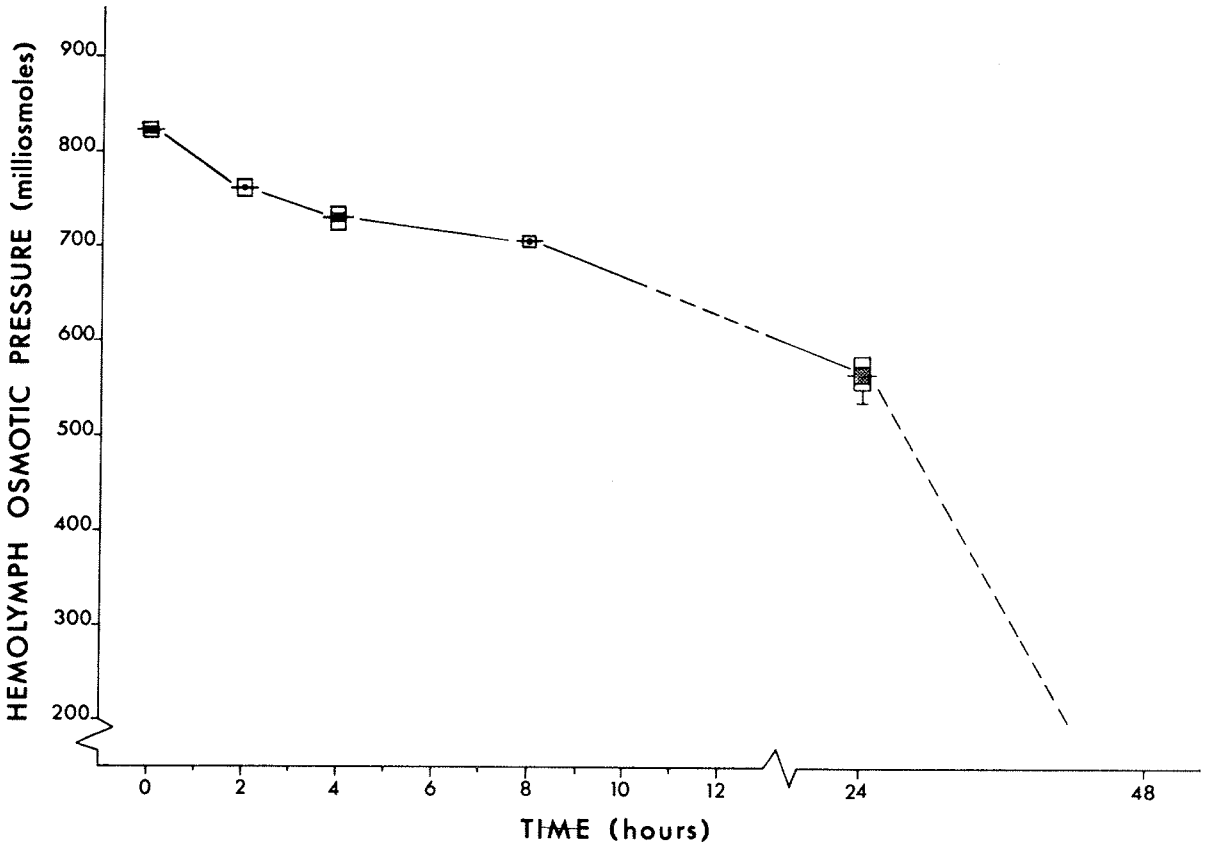

Figure 18. Rate of decline of hemolymph osmotic pressure of M. sabini for 24 hours following transfer to freshwater from 25‰ seawater.

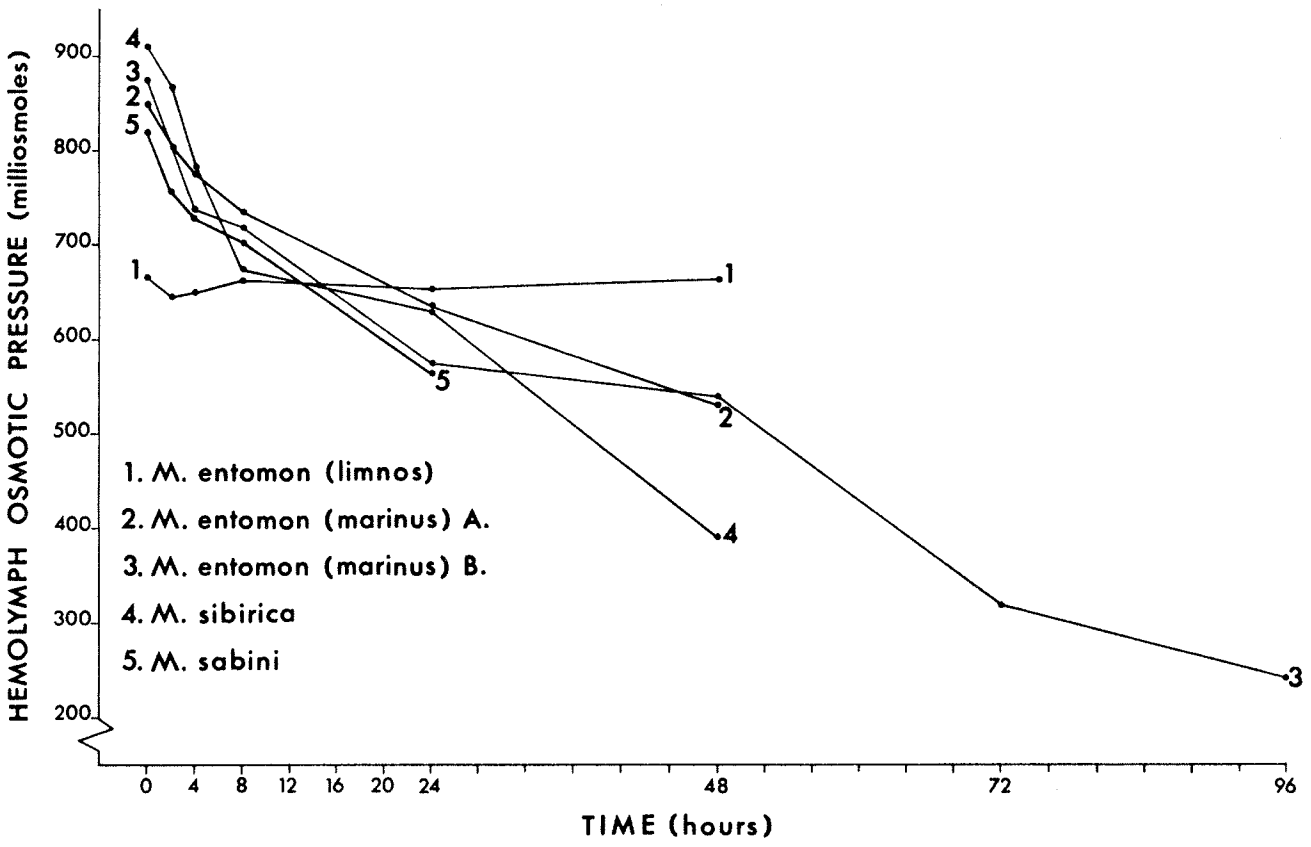

Figure 19. Comparison of rates of decline of hemolymph osmotic pressures in M. entomon (limnos), M. entomon (marinus), M. sibirica and M. sabini following transfer to freshwater.

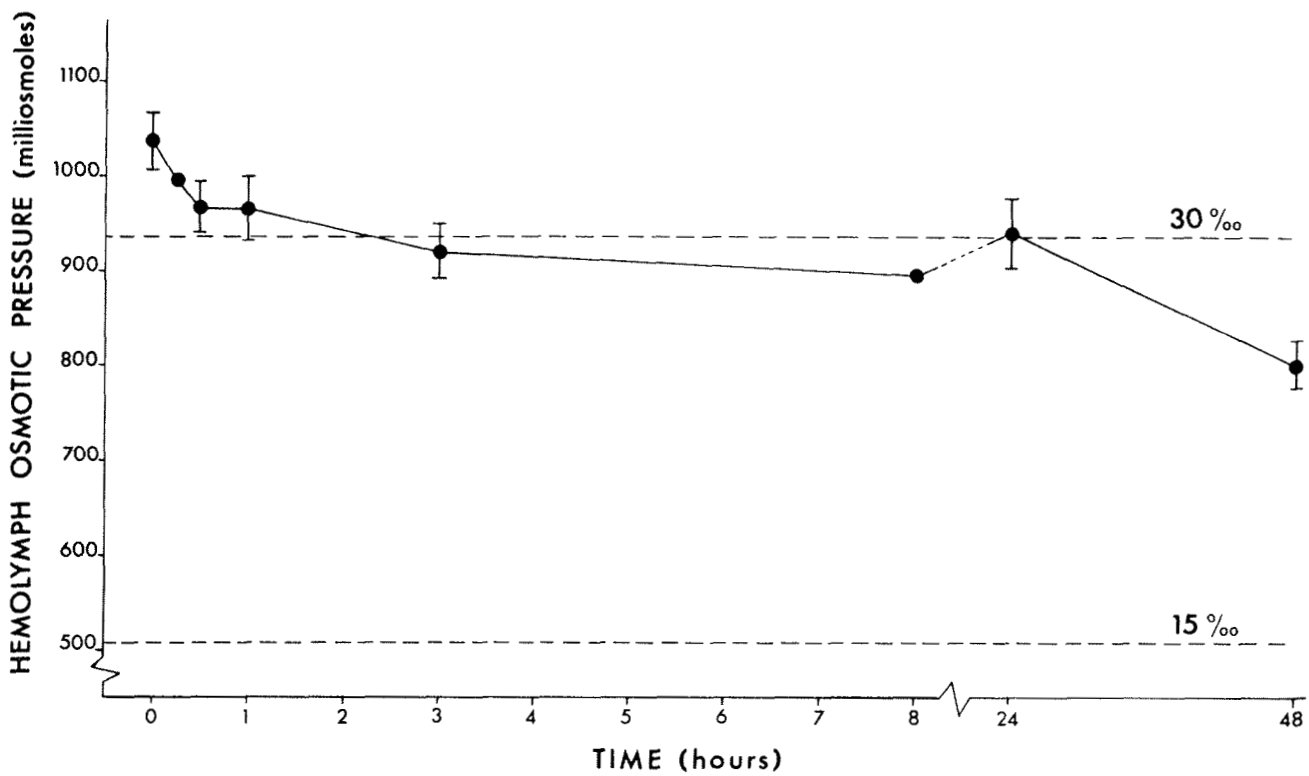

Figure 20. Time course of change in hemolymph osmotic pressure of M. entomon (marinus) following a change in salinity from 30‰ to 15‰. Osmotic pressures of the two media indicated by broken lines. Vertical lines represent standard deviations.

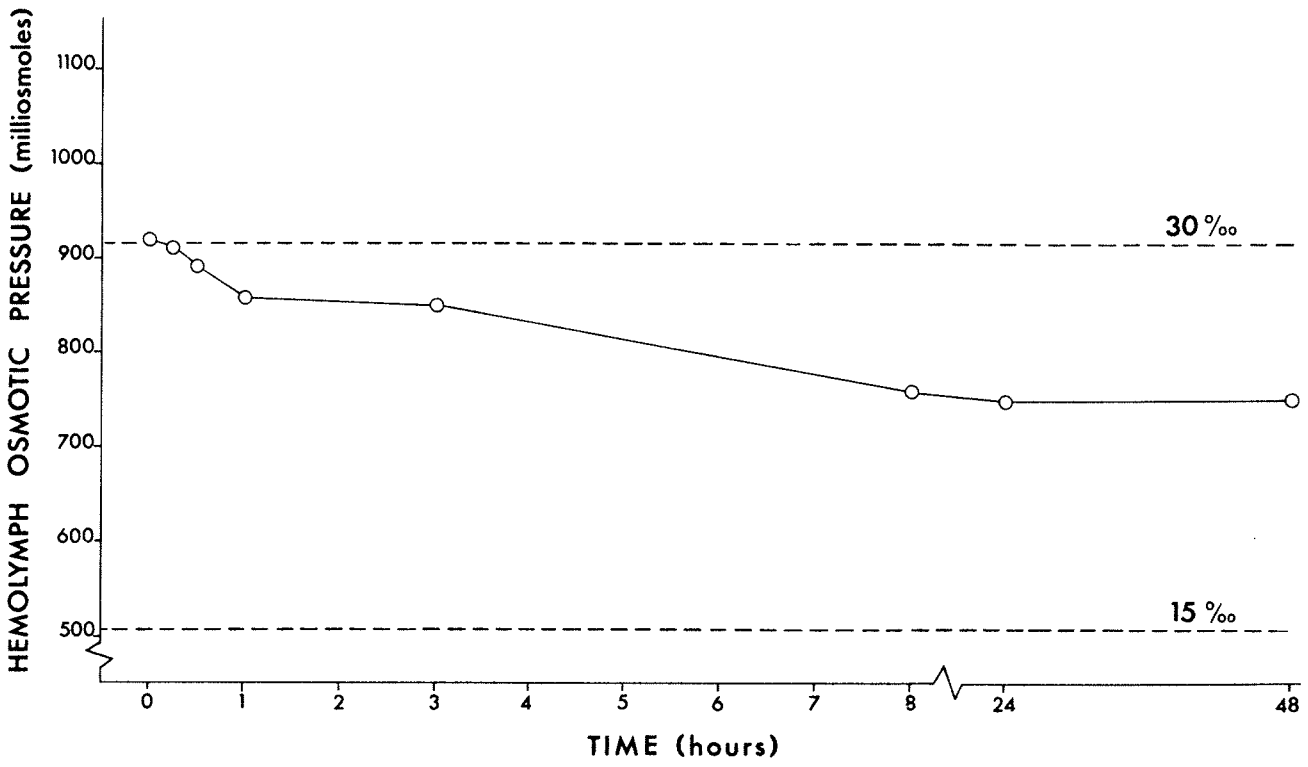

Figure 21. Time course of change in hemolymph osmotic pressure of M. sibirica following a change in salinity from 30‰ to 15‰. Osmotic pressures of the two media indicated by broken lines. All of the standard deviations fall within the perimeters of the data points.

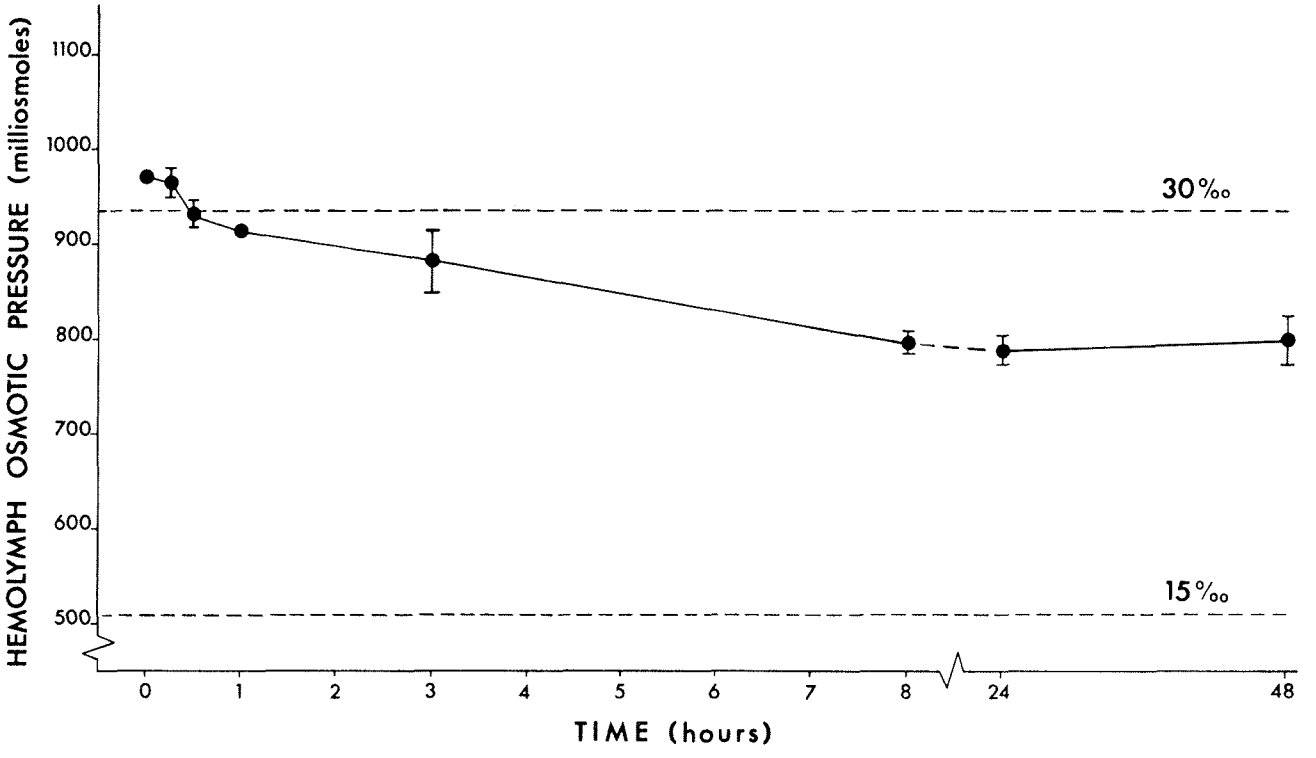

Figure 22. Time course of change in hemolymph osmotic pressure of M. sabini following a change in salinity from 30‰ to 15‰. Osmotic pressures of the two media indicated by broken lines. Vertical lines represent standard deviations.

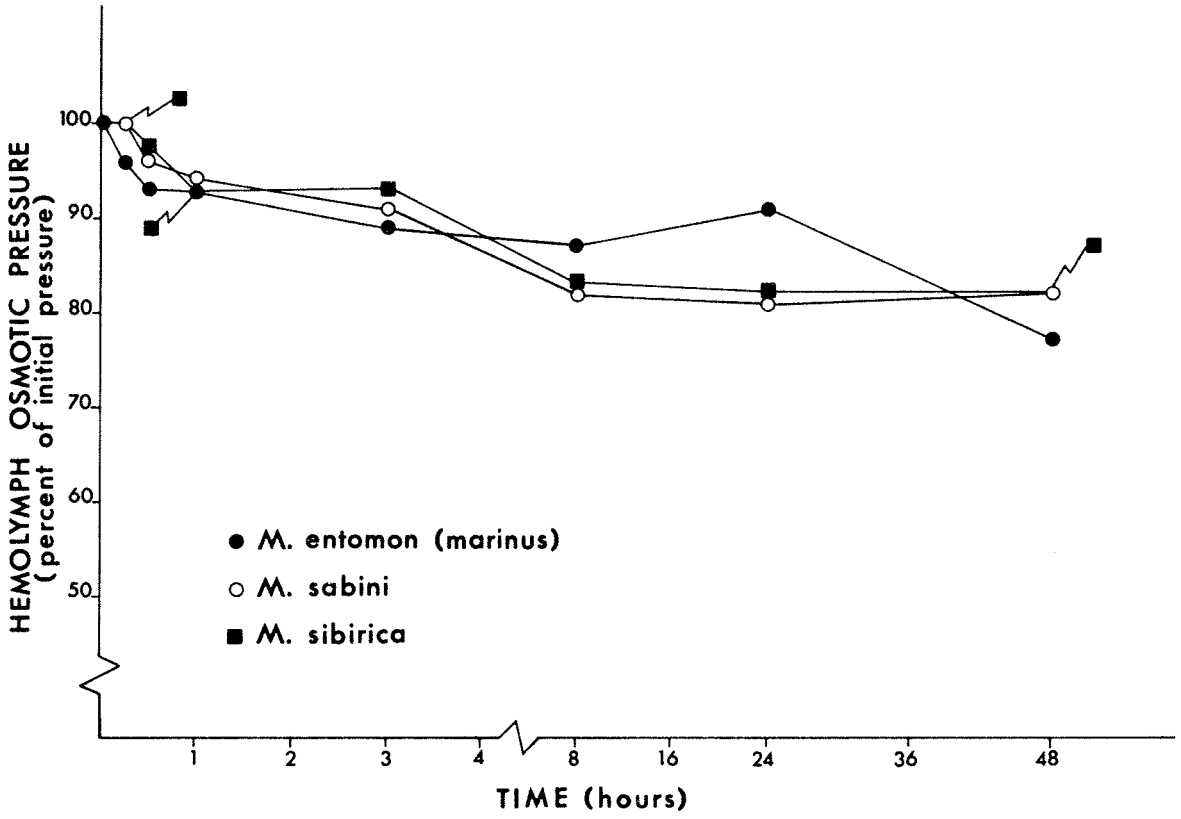

Figure 23. Comparison of rates of change of hemolymph osmotic pressures of M. entomon (marinus), M. sibirica and M. sabini following a change in salinity from 30‰ to 15‰.

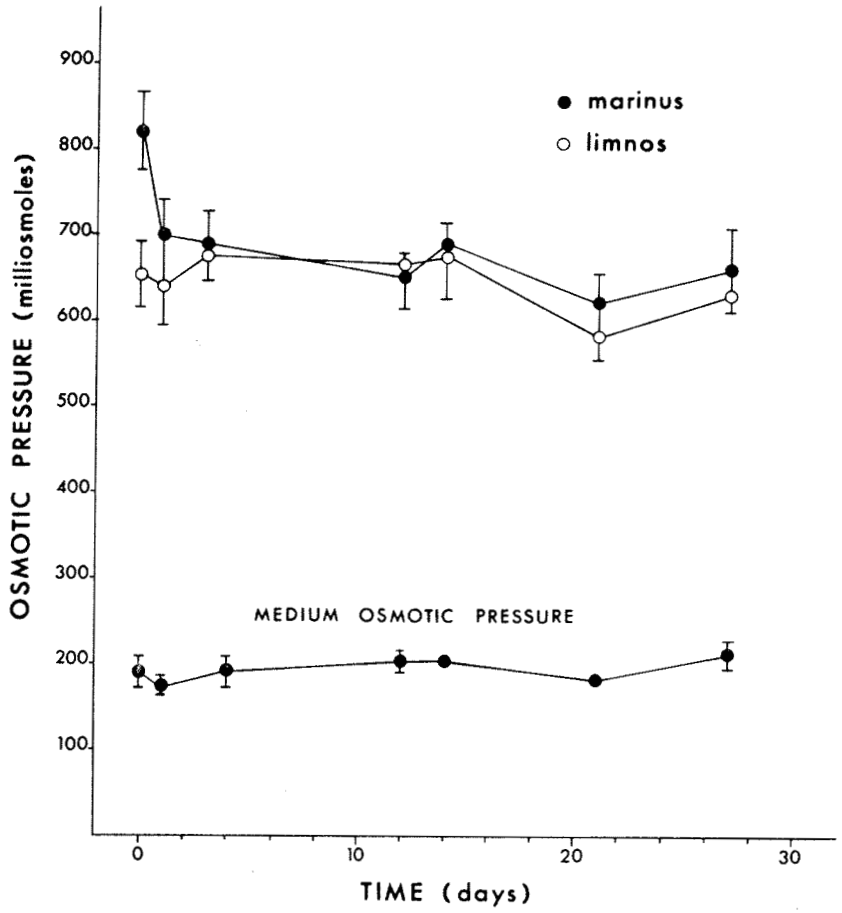

Figure 24. Effect of long-term (27 days) acclimation at low salinity (5‰) on the osmotic pressure differential between the hemolymph of M. entomon (marinus) and M. entomon (limnos). M. entomon (marinus) transferred from 25‰ seawater and M. entomon (limnos) from freshwater. Vertical lines indicate standard deviations.

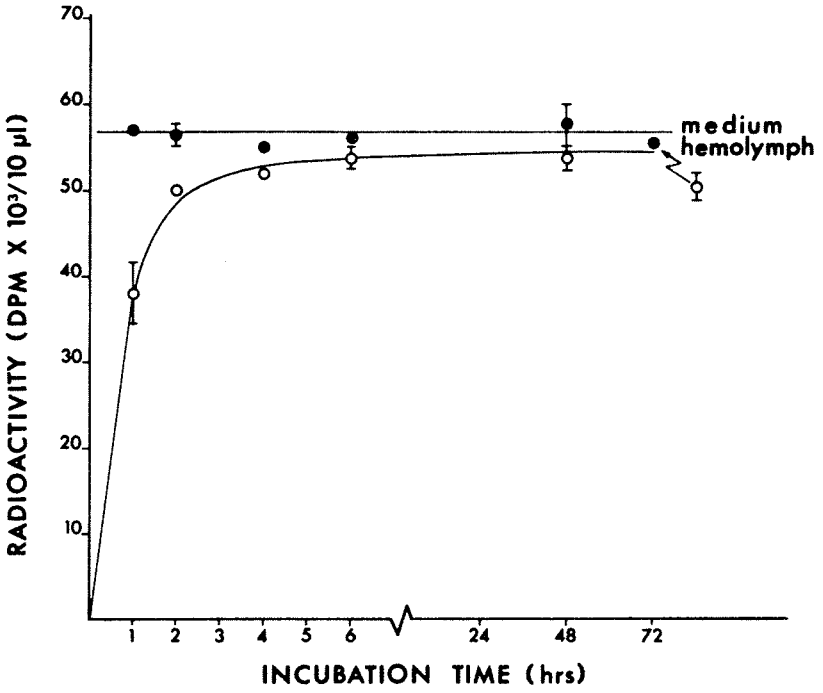

Figure 25. Uptake of tritiated water from labelled medium by Mesidotea entomon (marinus) at 25°/₀₀ salinity and 5°C during a 72 hour incubation period. Each point is the mean value for 3 animals. Vertical lines represent standard deviations.

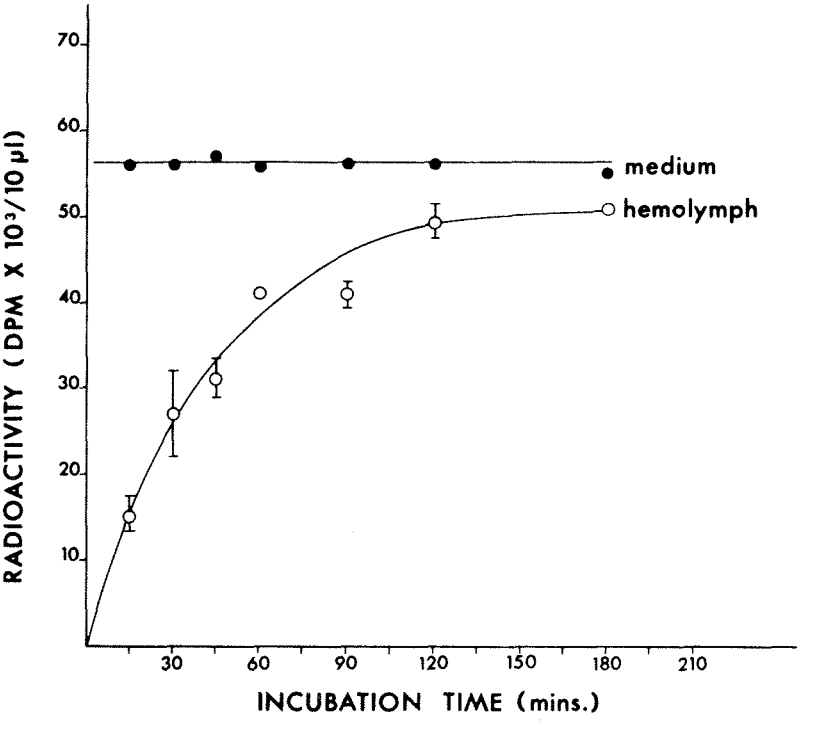

Figure 26. Uptake of tritiated water from labelled medium by Mesidotea entomon (marinus) at 25‰ salinity and 5°C during a 3 hour incubation period. Each point is the mean value for 3 animals. Vertical lines represent standard deviations.

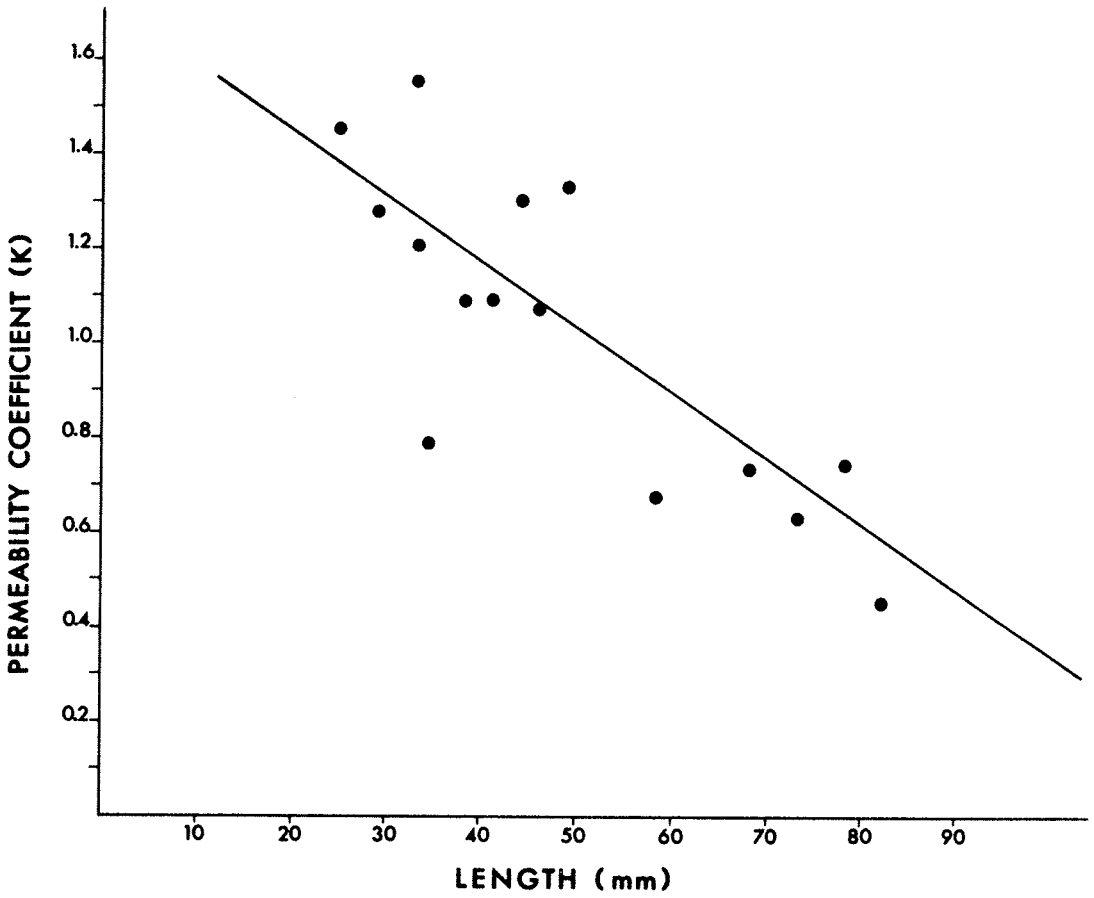

Figure 27. Effect of animal size on the permeability coefficient (K) of Mesidotea entomon (marinus) at 25°/₀₀ salinity and 5°C.

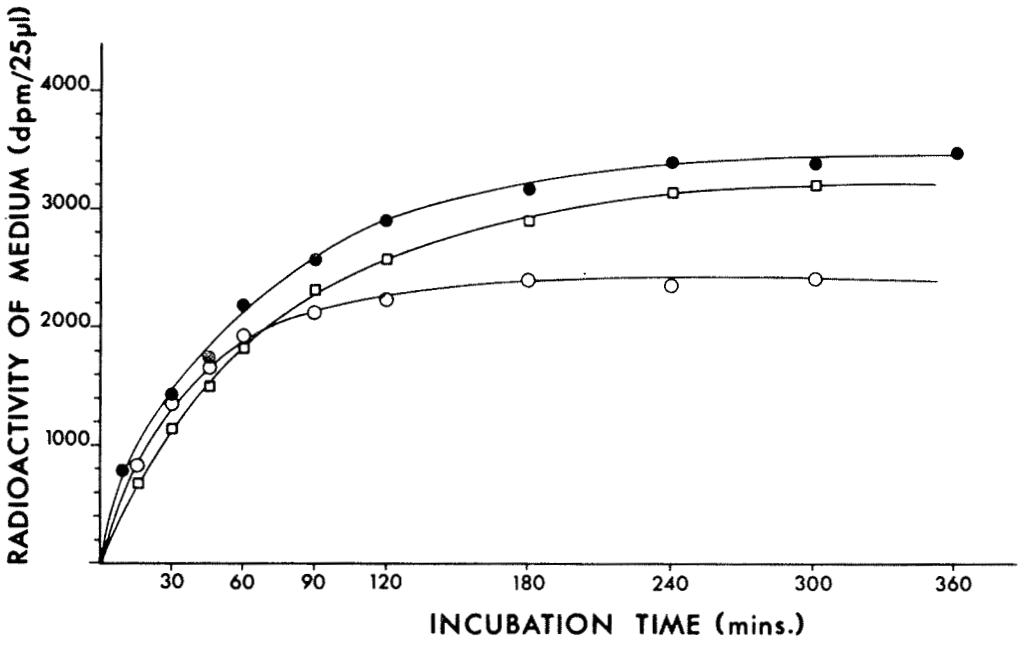

Figure 28. Efflux of tritiated water from Mesidotea entomon (marinus) at 25‰ salinity and 5°C. Results shown for 3 different animals.

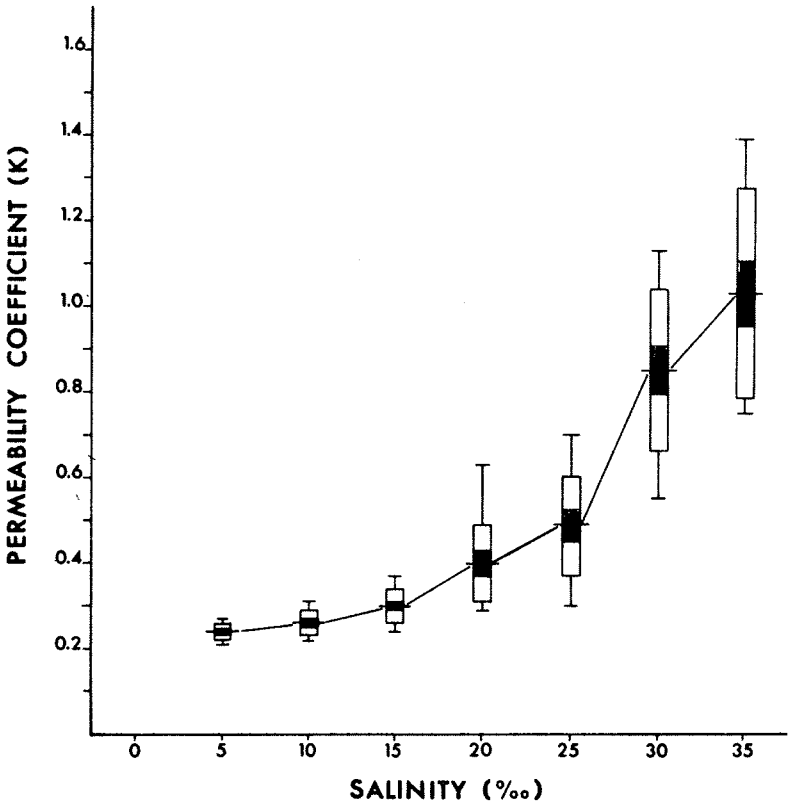

Figure 29. Effect of salinity on the permeability coefficient (K) of Mesidotea entomon (marinus) at 5°C.

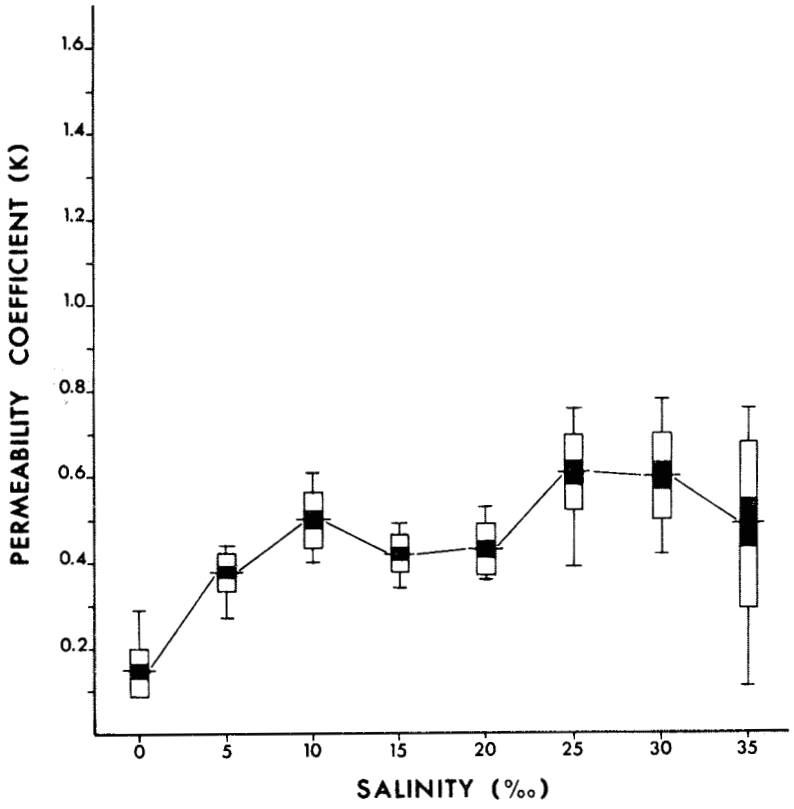

Figure 30. Effect of salinity on the permeability coefficient (K) of Mesidotea entomon (limnos) at 5°C.

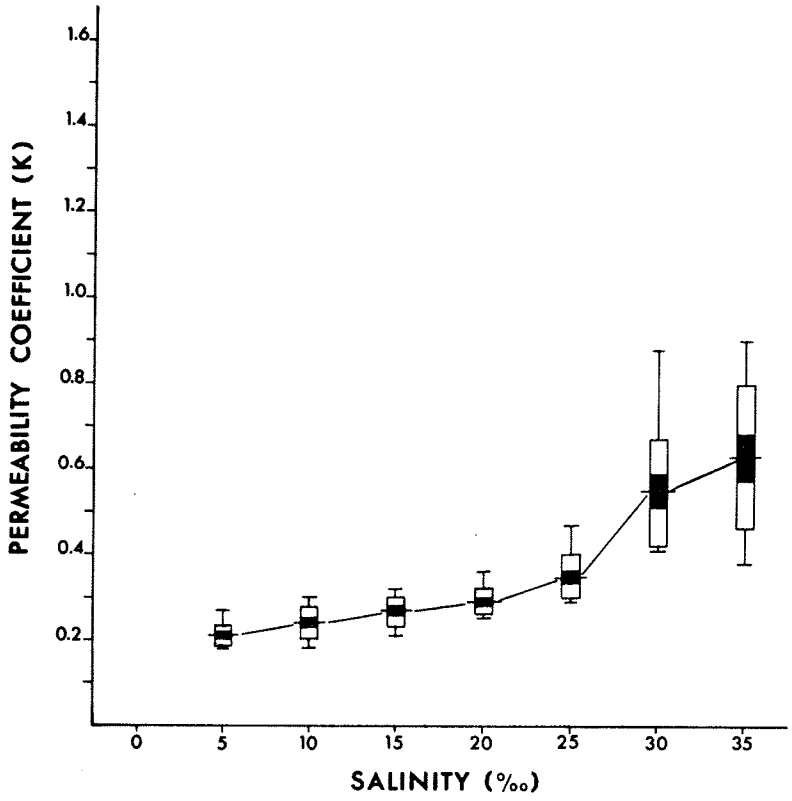

Figure 31. Effect of salinity on the permeability coefficient (K) of Mesidotea sibirica at 5°C.

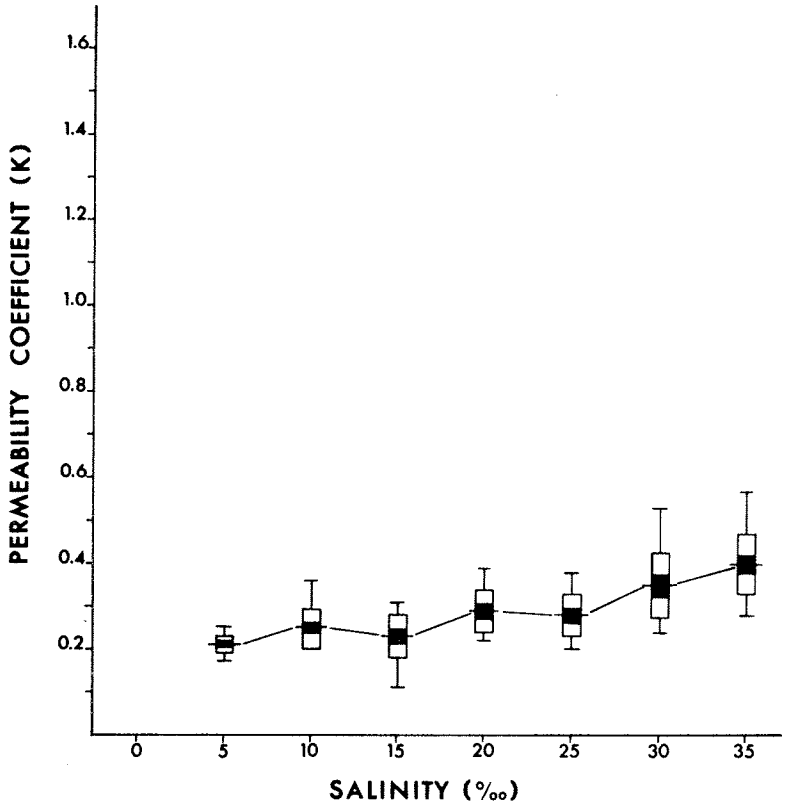

Figure 32. Effect of salinity on the permeability coefficient (K) of Mesidotea sabini at 5°C.

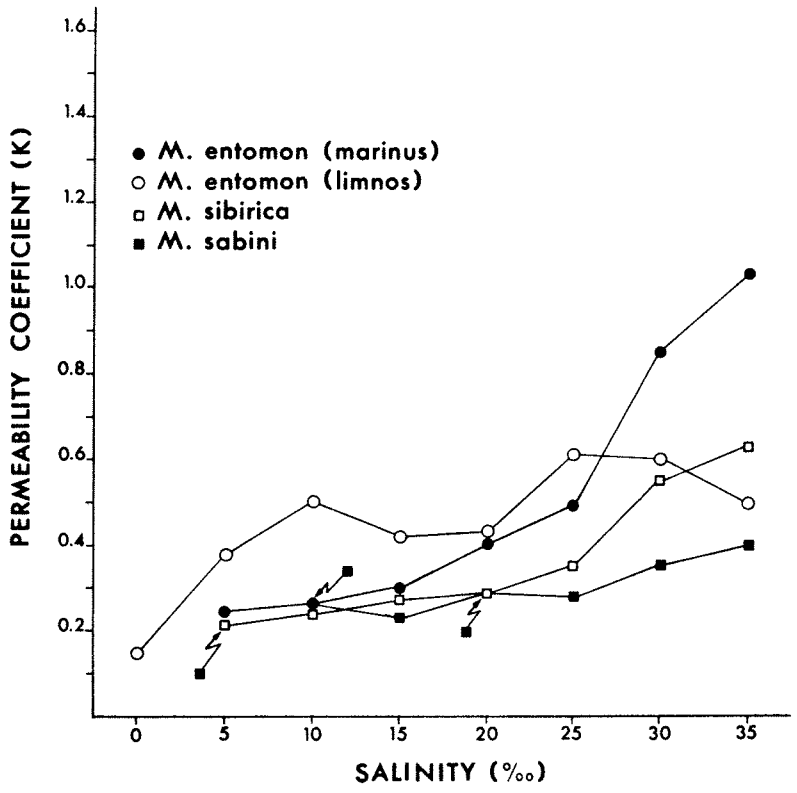

Figure 33. Comparison of the effects of salinity on the permeability coefficients (K) of Mesidotea entomon (marinus), M. entomon (limnos), M. sibirica and M. sabini at 5°C.

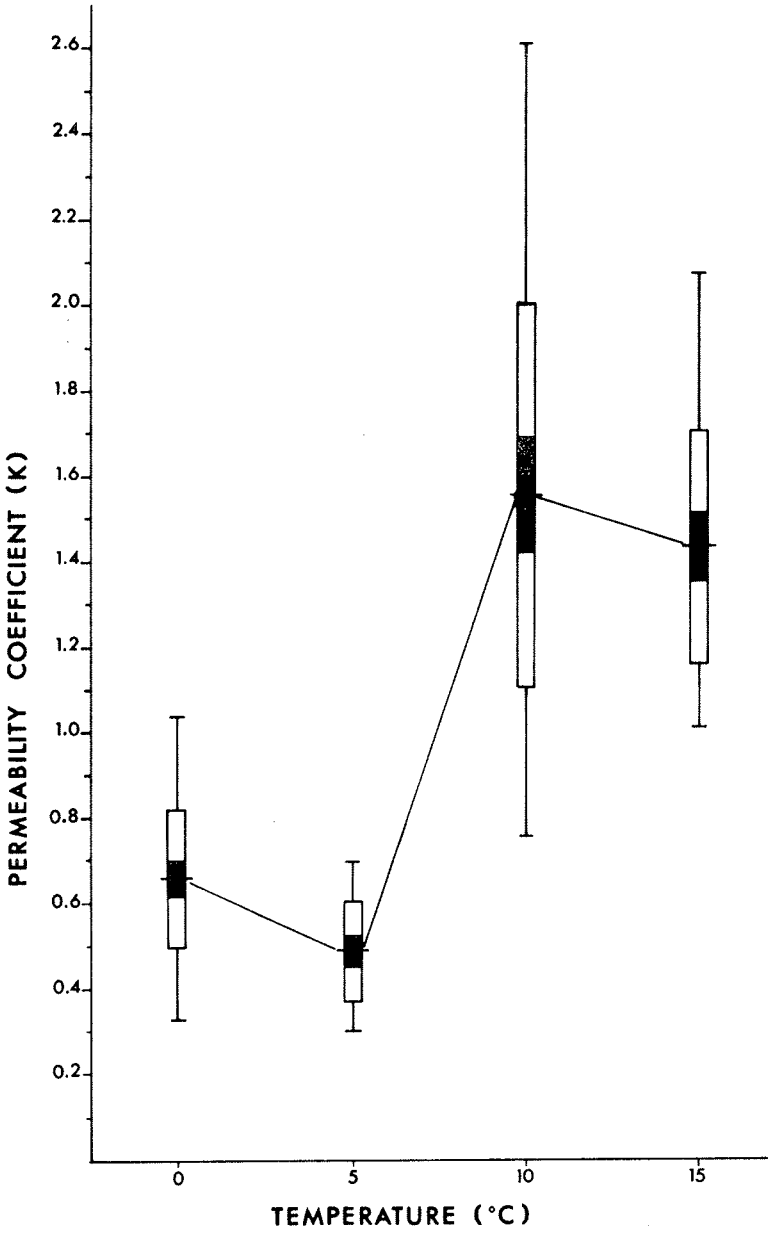

Figure 34. Effect of temperature on the permeability coefficient (K) of Mesidotea entomon (marinus) at 25‰ salinity.

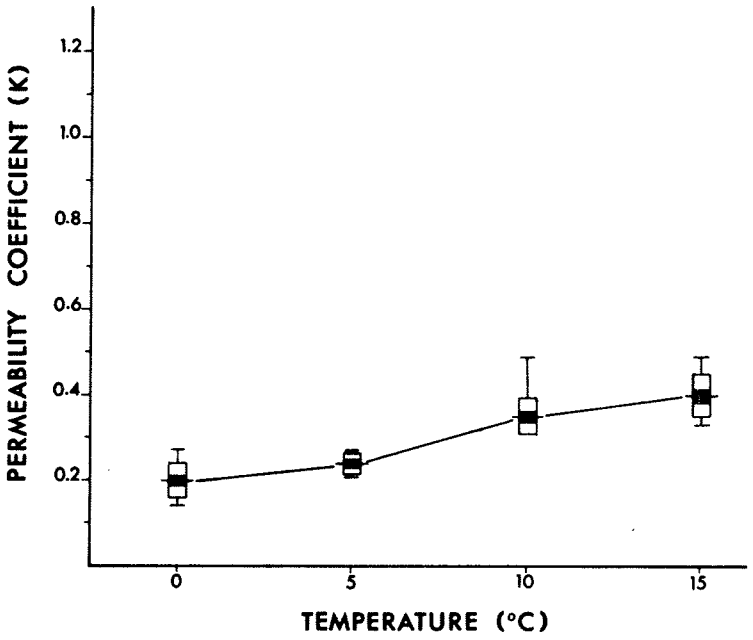

Figure 35. Effect of temperature on the permeability coefficient (K) of Mesidotea entomon (marinus) at 5°/₀₀ salinity.

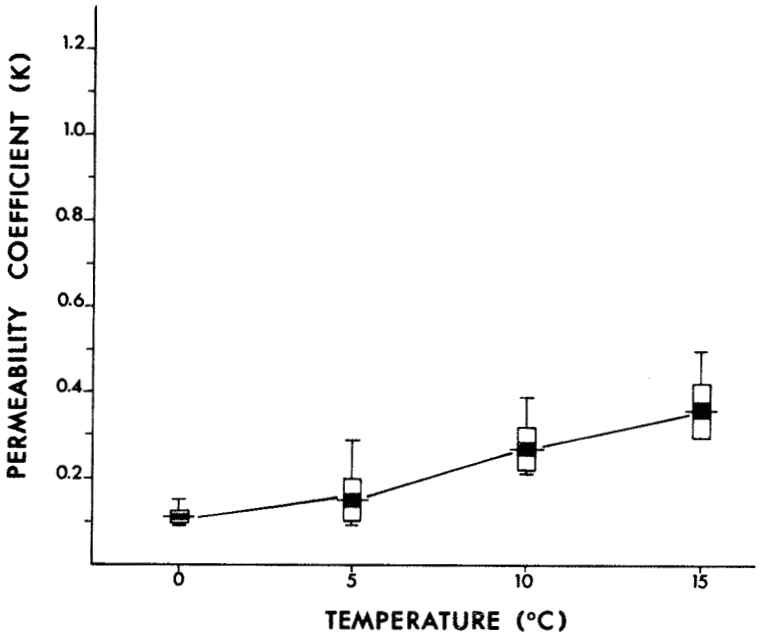

Figure 36. Effect of temperature on the permeability coefficient (K) of Mesidotea entomon (limnos) at 0‰ salinity.

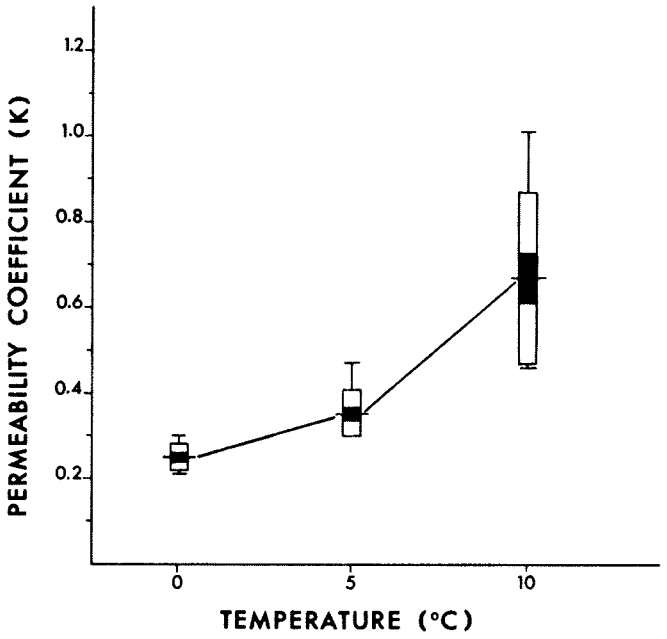

Figure 37. Effect of temperature on the permeability coefficient (K) of Mesidotea sibirica at 25‰ salinity.

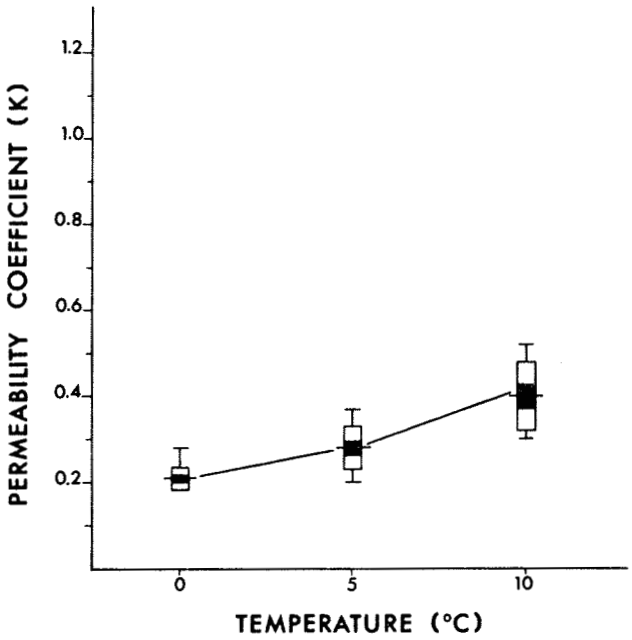

Figure 38. Effect of temperature on the permeability coefficient (K) of Mesidotea sabini at 25‰ salinity.

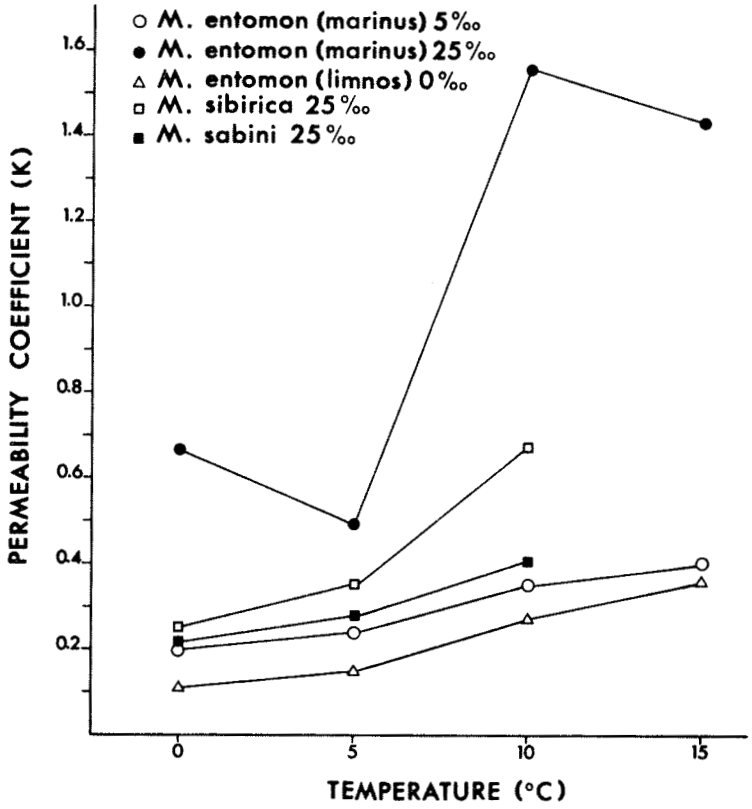

Figure 39. Comparison of the effects of temperature on the permeability coefficients (K) of Mesidotea entomon (marinus), M. entomon (limnos), M. sibirica and M. sabini.

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