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Studies on Factors Influencing the Respiratory Metabolism of an Arctic Marine Amphipod, *Onisimus (=Boeckosimus) affinis.*

J. A. Percy

Arctic Biological Station
Department of Fisheries and Oceans
Ste. Anne de Bellevue, Quebec H9X 3R4

December 1980

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No 240

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Gouvernement du Canada Pêches et Océans

Canadian Data Report of Fisheries and Aquatic Sciences

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December 1980

STUDIES ON FACTORS INFLUENCING THE RESPIRATORY METABOLISM OF AN ARCTIC MARINE AMPHIPOD, ONISIMUS (=BOECKOSIMUS) AFFINIS

by

J. A. Percy

Arctic Biological Station
Department of Fisheries and Oceans
555 St. Pierre Boulevard
Ste. Anne de Bellevue, Quebec H9X 3R4

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Percy, J. A. 1980. Studies on factors influencing the respiratory metabolism of an arctic marine amphipod, Onisimus (=Boeckosimus) affinis. Can. Data Rep. Fish. Aquat. Sci. 240: iv + 70 p.

This report serves as a repository for tabular data pertaining to several factors influencing the respiratory metabolism of the arctic marine amphipod, Onisimus affinis. Among the factors considered are size, temperature, salinity, season, time of day, respirometry technique, duration of captivity, starvation and refeeding, sex and reproductive condition.

Key words: Arctic amphipod, respiration, modifying factors, metabolism

RÉSUMÉ

Percy, J. A. 1980. Studies on factors influencing the respiratory metabolism of an arctic marine amphipod, Onisimus (=Boeckosimus) affinis. Can. Data Rep. Fish. Aquat. Sci. 240: iv + 70 p.

Ce rapport sert de répertoire pour les données tabulaires reliées à les facteurs qui influencent le metabolisme respiratoire de l'amphipode arctique marin, Onisimus affinis. Parmi les facteurs considerés sont le taille, la température, la salinité, la saison, l'heure du jour, la technique de la respirometrie, la durée de la captivité, la privation de nourriture et la realimentation, le sexe et la condition reproducteur.

INTRODUCTION

Much interest has been expressed in the possible occurrence in polar marine organisms of compensating adjustments in metabolism that would permit them to function more effectively at the prevailing low temperature than would otherwise be possible (Spärck, 1936; Thorson, 1936; Scholander et al., 1953; Holeton, 1974; White, 1975; and Opalinski, 1979). The available data do not permit unequivocal generalizations to be made on this point. Certain species appear to exhibit a compensatory elevation of respiratory metabolism relative to that of comparable warmer water species, while others clearly do not. Holeton (1974) has convincingly argued that, at least in the case of fish, some apparent instances of cold adaptation in polar forms may in fact result from methods used in determining respiration rates rather than reflect a valid physiological phenomenon.

It is unlikely that this uncertainty will be satisfactorily resolved until a great deal more information becomes available concerning the respiratory metabolism of a much broader range of polar marine invertebrates. Interpretation of the data will also require complementary studies concerning the role of the many endogenous and exogenous variables that may have a significant influence on the metabolism of these organisms. In many of the studies undertaken thus far it is precisely this lack of complementary information that has given rise to uncertainty about the correct interpretation to be placed upon observed differences in metabolic rate between polar and temperate species.

Information about the metabolic rates of Antarctic marine invertebrates has increased steadily over the past several years. Comparable data for Arctic species are surprisingly sparse. In view of the pronounced differences, both now and in the past, between the South and the North Polar Oceans (Knox and Lowry, 1977) it appears likely that a great deal of information about the ecological physiology of many species from both areas will be required in order to derive sound generalizations about the occurrence, evolutionary development and energetic significance of such compensatory metabolic adaptations.

During recent studies (Percy, 1975) on the physioecology of the circumpolar arctic marine amphipod *Onisimus affinis* a great deal of information was obtained about the influence of several factors on the respiratory metabolism of this species. The present report serves as a repository for the bulk of the tabular data, pertaining to respiratory metabolism, arising from these studies. Among the factors considered are size, temperature, salinity, season, time of day, respirometry technique, duration in captivity, starvation and refeeding, sex and reproductive condition.

METHODS

COLLECTION OF ANIMALS

The amphipods used in this study were collected with baited traps in about 20 m of water at a site adjacent to the Arctic Biological Station field laboratory located near the entrance to the Eskimo Lakes (69°25'N, 131°16'W; station 507 of Wacasey, 1974). The Lakes are a series of complex marine embayments connected by a narrow channel to the foot of Liverpool Bay. Salinity decreases progressively with increasing distance from the bay. Bottom salinities in the vicinity of the collecting site ranged from 13.4 to 17.2°/₀₀, with the lowest values occurring in the spring during ice break-up. Bottom water temperatures ranged from -0.97 to 9.07°C during the year.

The animals were transported rapidly to the field laboratory in seawater in insulated containers. Subsequent procedures varied according to the requirements of the different studies and are outlined in the appropriate subsections below. Generally, animals were maintained in the field laboratory in natural seawater at a temperature and salinity comparable to that in the natural habitat. Animals transported by air to the Arctic Biological Station in Ste. Anne de Bellevue were maintained in a high capacity refrigerated recirculating seawater system containing artificial seawater (Instant Ocean) of 17°/₀₀ at a temperature of 1° ± 1°C. They were fed regularly with Tetramin tropical fish food. Under these conditions they could be maintained in an apparently healthy and active state for an indefinite period.

MEASUREMENT OF RESPIRATION

Three different techniques were used during different phases of the study for measuring the rate of oxygen consumption by the amphipods.

a) Gilson respirometry

Oxygen consumption was measured with a Gilson submarine, volumetric, respirometer equipped with 15 ml respirometer flasks. Each flask usually contained 4-6 animals, unless otherwise noted, and 5 ml of Millipore filtered seawater. The centre well was charged with 0.2 ml of 20% KOH. Readings were generally taken every hour for 5 hours, following an initial 45 minute incubation period. Cumulative oxygen uptake was plotted against time and the slope of the resulting line used to calculate the mean rate. The animals were rinsed in distilled water, measured to the nearest 0.1 mm utilizing a projection method, and dried at 70°C to constant weight. Oxygen uptake is expressed as either µl O_2/animal/hr or as µl O_2/mg dry weight/hr.

b) Polarographic respirometry

In some instances, respiration rate was measured by means of a YSI model 53 Biological Oxygen Monitor. One or two animals were placed in small (approximately 30 ml) volume-calibrated Erlenmeyer flasks fitted with ground glass stoppers and containing temperature-equilibrated, well-aerated seawater. Usually 15-20 of these respirometer flasks were incubated simultaneously, with at least two of them containing no animals and designated as controls. A sample of the initial seawater was collected in a standard BOD bottle for analysis of dissolved oxygen by the Winkler technique. The respirometer flasks were incubated in a water bath at the experimental temperature for a period which varied from 5-8 hours depending upon experimental temperature and animal size. The oxygen content of the respirometer flasks generally did not fall below 50-60% of saturation during incubation. At the end of the incubation period the respirometer flasks were individually transferred to a small temperature-equilibrated water bath mounted on a magnetic stirrer. A micro-stir bar was placed in the flask and an oxygen electrode, encased in a silicone cone that effectively seals the mouth of the respirometer flask and displaces the surface water, was inserted. The percentage oxygen saturation was measured in each of the respirometer flasks, including the controls. The difference in oxygen concentration between the experimental flask and the mean value of the controls was used to calculate the rate of oxygen consumption by the animals. The animals were rinsed and dried to constant weight at 70°C. Respiration rate is expressed both as $\mu l\ O_2$/animal/hr and as $\mu l\ O_2$/mg dry weight/hr.

c) In situ respirometry

To measure the respiration rate of the amphipods at different times of the day and during different seasons, under conditions as similar to those in the natural habitat as possible, and with minimal disturbance to the animals, an in situ respirometry technique was devised. Respirometer flasks consisted of 125 ml volume-calibrated Erlenmeyer flasks fitted with ground glass stoppers. These flasks were mounted in groups of 12 in submersible racks. At the beginning of a determination the flasks were filled with seawater taken from the same depth as that at which the flasks were to be incubated (generally 20 metres). A sample of the same water was collected in a standard BOD bottle and used for oxygen determination by the Winkler technique. Freshly collected O. affinis were placed in each of the respirometer flasks (5 animals in the case of 24-hour incubations, and 20 animals in the case of 4-hour incubations). At least two of the respirometer flasks in each rack contained no animals and served as controls. The rack of bottles was lowered to the incubation depth and left undisturbed for the duration of the incubation period. At the end of this time the rack was retrieved and a sample of water from each respirometer flask was carefully collected in a 50 ml BOD bottle. The oxygen content was measured by the Winkler technique, appropriately modified for the 50 ml sample size. The initial oxygen content in each of the respirometer flasks was calculated from the mean O_2 content measured in the control flasks. The animals in each of the flasks were rinsed and dried to constant weight at 70°C. Respiration rate is expressed as µl O_2/mg dry weight/hr.

FACTORS CONSIDERED

a) Size

To determine the relationship between animal size and metabolic rate the oxygen uptake of as wide a size range of animals as possible was measured by the polarographic technique at temperatures of 0°, 5°, 10°, 15°, and 20°C. Filtered natural seawater of 14°/₀₀ salinity was used as an incubation medium. Animals were normally utilized within three days of collection and were kept for at least one night in a tank in the laboratory at a temperature and salinity similar to that in the natural habitat. A single animal was used in each respirometer flask. The respirometers were held in a water bath at the experimental temperature for the duration of the incubation period which ranged from 5-11 hours depending upon animal size and experimental temperature. Oxygen uptake was calculated as µl O_2/animal/hr. The logarithmic regression of this rate on animal dry weight was computed for each of the temperature groups. The logarithmic regression of weight-specific respiration rate on animal dry weight was also calculated. To permit comparison of the respiration rates at the different temperatures, the oxygen uptake of a standard 10-mg animal was calculated from the appropriate regression equations.

b) Temperature

Some information concerning the influence of temperature on metabolic rate was obtained during the study of size-rate relationships. To further clarify the situation, particularly with regard to seasonal changes in the R-T curve, respiratory determinations at a series of temperatures were made on three separate occasions (winter, early summer and late summer). Measurements were made using the Gilson technique at a range of temperatures between 0° and 22°C. Each respirometer flask contained 4-5 similar-sized animals in natural seawater with a salinity of 17°/₀₀. Between 7 and 9 respiratory determinations were made at each experimental temperature.

The effect of acclimation to summer-like and winter-like temperatures on the metabolic rate-temperature relationships of O. affinis was studied in the Ste. Anne de Bellevue laboratory. Groups of the animals were transferred to static tanks containing seawater of 0° and 12°C and allowed to acclimate at these temperatures for two weeks. Following this acclimation period the metabolic rate of each group was determined by the Gilson technique at a series of temperatures ranging from 0° to 20°C. Seven to 17 determinations were carried out at each temperature. Four animals were placed in each respirometer flask, along with filtered 17°/₀₀ artificial seawater as an incubation medium.

Q_{10} coefficients for the rate-temperature relationships of both summer- and winter-adapted animals and of 0° and 12°C laboratory-acclimated animals were calculated according to the formula given in Table 1.

c) Salinity

Studies on the influence of salinity on respiratory metabolism were carried out in Ste. Anne de Bellevue, using the Gilson technique. Two separate sets of experiments were carried out. In the first the animals were held in tanks of 17°/₀₀ seawater until required and then acutely exposed to a range of experimental salinities between 5°/₀₀ and 35°/₀₀ during the Gilson run. In the second experiment the animals were acclimated for at least 10 days in tanks of seawater of the same salinity as that used for the determination of metabolic rate. The range of salinities was again between 5°/₀₀ and 34°/₀₀. Four similar-sized animals were placed in each respirometer flask. Seven to 11 respiratory determinations were made at each experimental salinity.

d) Time of day

To determine if the respiration rate of *O. affinis*, as measured by the in situ technique, fluctuates significantly, and in a regular manner, over the course of a 24-hour period, a preliminary series of measurements was undertaken at 4-hour intervals over a 2-day period. Respirometer flasks were filled with water collected at the incubation depth, while the animals were taken from holding cages kept on the bottom in 20 metres of water. Twenty animals were placed in each flask and the rack of flasks was immediately lowered to 20 metres for the duration of the incubation period (approximately 4 hours). Two complete racks of respirometer flasks were used; one was set in place as the other was retrieved. The animals were rinsed and dried to constant weight at 70°C. The whole exercise was repeated twice, once on 21-22 July and again on 13-14 August. Simultaneous determinations were also made of tidal amplitude, light intensity and relative abundance of animals in and out of the substratum; however, only the metabolic data are presented in this report.

e) Season

To investigate possible seasonal changes in metabolic rate three different approaches were utilized. The respiration rate was measured in the laboratory immediately after collection, at fixed temperatures of 0° and 10°C, at intervals during the year. Initially, measurements were made using the polarographic technique, while later ones were made using the Gilson technique. Five complete sets of determinations were made with each of these techniques. The incubation medium consisted of natural seawater adjusted to a salinity of 17°/₀₀. An additional series of metabolic rate determinations was made using the in situ technique. The respirometer flasks containing freshly collected animals were incubated at 20 metres at the prevailing temperature and salinity. Eight complete series of determinations were carried out. Q_{10} coefficients were calculated for the seasonal metabolic rates determined at fixed temperatures of 0° and 10°C.

f) Duration in captivity

A preliminary series of experiments was carried out to determine the effect of holding the animals in the laboratory on their metabolic rate. In one group of animals the respiration rate was measured at 8°C by the Gilson technique, within 48 hours of collection. The second group collected at the same time, was held for 18-20 days in a laboratory holding tank at 5°C and 15°/₀₀ salinity. The metabolic rate of this group was also measured at 8°C by the Gilson technique. Each group contained a wide size range of animals, making it possible to calculate the logarithmic regression of respiration rate on dry weight as well as the usual weight-specific respiration rate.

g) Starvation and refeeding

To examine the effect of short-term starvation on metabolic rate, groups of amphipods were held in 17°/₀₀ seawater at a temperature of 10°C. At 24-hour intervals subsamples of 8-14 animals were taken for determination of metabolic rate by the Gilson technique. Prior to the 0-hour determination, and immediately after the 96-hour determination, the animals were fed Tetramin in excess. The metabolic rate was again determined after 120 hours, approximately 24 hours after the animals had been refed.

h) Sex and reproductive condition

Groups of males, females and gravid females (having brood pouches filled with early stage embryos) were selected from the laboratory stock maintained in Ste. Anne de Bellevue. The respiration rate was measured at 10°C by the Gilson technique. Subsamples of all three groups were utilized simultaneously in metabolic rate determinations. In all, 12, 13 and 15 separate measurements were made on males, females and gravid females, respectively.

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Table 1. Explanation of symbols used in tables.

QO_2	Respiration rate ($\mu l\ O_2$/animal/hr).
QWO_2	Weight specific respiration rate ($\mu l O_2$/mg dry weight/hr).
QO_2(10 mm) QO_2(10 mg)	Respiration rate of "standard" 10 mm (10 mg) animal calculated from regression equation of log QO_2 on log length (weight) ($\mu l\ O_2$/10 mm (mg) animal/hr).
Q_{10}	Temperature coefficient of respiration rate calculated according to the formula: $$\log Q_{10} = \frac{10(\log k_1 - \log k_2)}{t_1 \quad t_2}$$ where k_1 and k_2 are the respiration rates at temperatures t_1 and t_2, respectively.
w	Mean dry weight (mg) of animal(s) in a single respirometer flask.
W	Mean dry weight (mg) of animals in a designated set of samples.
ℓ	Mean body length (mm) of animal(s) in a single respirometer flask.
L	Mean body length (mm) of animals in a designated set of samples.
n	Number of animals in a single respirometer flask.
N	Number of separate respiratory determinations in a particular experimental series.
$\overline{X}$	Mean value for a designated set of data.
S.D.	Standard deviation.
S.E.M.	Standard error of the mean (S.D./$\sqrt{N}$).
C.V.	Coefficient of variation (S.D./$\overline{X}$ x 100).
C.I.(95%)	±95% confidence interval for the mean.

Table 1 (continued).

a and b	Intercept and regression coefficient, respectively, for the regression equations: $\log QO_2 = a + b \log w$ and $\log QO_2 = a + b \log \ell$
a´ and b´	Intercept and regression coefficient, respectively, for the regression equations: $\log QWO_2 = a' + b' \log w$ and $\log QWO_2 = a' + b' \log \ell$
S.E.R.	Standard error of regression coefficient (b).
r^2	Correlation coefficient for the regression.
S.E.E.	Standard error of estimate for the regression.
d/m/y	All dates indicated in day/month/year format.
*	Designated value not included in the calculation of the mean.
T°	Incubation temperature in °C.
S°/oo	Incubation salinity in p.p.t.
IOSW	Instant Ocean seawater.
NSW	Natural seawater.

Table 2. Relationship between weight (w) and respiration rate (QO_2 and QWO_2) of *O. affinis* measured polarographically at different temperatures (n = 1; S°/₀₀ = 14°/₀₀; NSW: incubation period = 5 - 11 h; 16-31/8/73.

T°														
0°			5°			10°			15°			20°		
w	QO_2	QWO_2	w	QO_2	QWO_2	w	QO_2	QWO_2	w	QO_2	QWO_2	w	QO_2	QWO_2
16.01	1.96	0.12	7.96	3.76	0.47	4.21	2.17	0.52	8.92	5.50	0.62	1.50	1.84	1.23
1.26	0.11	0.09	5.04	2.89	0.57	3.90	2.90	0.74	14.59	7.80	0.53	9.86	6.66	0.68
10.62	4.59	0.43	5.79	2.12	0.37	11.55	7.24	0.63	6.01	3.20	0.53	9.71	9.18	0.95
3.58	0.84	0.23	3.24	2.53	0.78	1.28	1.23	0.96	8.95	3.00	0.34	13.75	9.32	0.68
13.18	4.47	0.34	4.33	1.77	0.41	3.94	3.63	0.92	1.67	0.60	0.36	1.85	2.72	1.47
3.56	0.93	0.26	4.00	2.42	0.61	2.93	2.52	0.86	1.38	0.40	0.29	1.45	3.10	2.14
8.69	2.58	0.30	0.85	0.76	0.89	4.20	2.36	0.56	23.50	13.20	0.56	1.08	1.28	1.19
6.59	1.55	0.24	1.75	0.97	0.55	8.84	2.97	0.34	1.62	1.60	0.99	5.10	3.50	0.69
3.14	0.83	0.26	3.46	1.39	0.40	12.53	9.05	0.72	4.37	1.30	0.30	24.73	12.72	0.51
15.22	3.40	0.22	1.64	1.27	0.77	6.60	5.37	0.81	4.01	1.40	0.35	4.17	3.78	0.91
1.21	0.55	0.45	4.27	2.33	0.55	8.46	3.71	0.44	8.15	3.00	0.37	9.94	10.50	1.06
3.37	1.79	0.53	8.27	7.39	0.89	13.64	10.67	0.78	12.17	4.20	0.35	12.32	10.54	0.86
9.84	1.86	0.19	7.32	4.46	0.61	5.47	3.87	0.71	5.56	2.50	0.45	4.81	2.98	0.62
0.22	0.21	0.95	1.05	0.99	0.94	9.55	7.16	0.75	4.20	2.76	0.66	1.69	1.06	0.63
1.81	0.60	0.33	7.99	3.83	0.48	15.36	13.87	0.90	13.27	9.40	0.71	1.71	3.70	2.16
1.33	0.44	0.33	4.55	3.55	0.78	18.69	10.16	0.54	3.57	0.90	0.25	4.63	3.20	0.69
5.85	1.61	0.28	1.48	1.08	0.73	13.77	8.05	0.58	1.63	0.80	0.49	11.92	9.43	0.79
3.92	1.56	0.40	3.28	2.21	0.67	0.76	0.78	1.03	3.23	1.90	0.59	10.97	5.60	0.51
7.29	1.93	0.26	5.84	3.66	0.63	3.21	1.86	0.58	1.70	1.00	0.59	10.25	6.90	0.67
17.80	5.84	0.33	6.12	3.92	0.64	0.27	0.31	1.15	4.17	1.30	0.31	1.68	2.18	1.30
11.90	6.18	0.52	1.11	0.77	0.69	1.07	0.45	0.42	1.86	3.50	1.88	7.59	5.53	0.73
11.53	3.96	0.34	3.63	2.22	0.61	2.76	1.14	0.41	5.63	2.40	0.43	9.42	7.50	0.80
3.23	0.96	0.30	8.48	5.90	0.70	3.14	1.95	0.62	4.50	1.60	0.36	1.74	1.93	1.11

Table 2 (continued).

T°														
0°			5°			10°			15°			20°		
W	QO_2	QWO_2	W	QO_2	QWO_2	W	QO_2	QWO_2	W	QO_2	QWO_2	W	QO_2	QWO_2
1.35	0.64	0.47	3.34	2.17	0.65	7.67	4.41	0.57	1.25	1.60	1.28	4.63	2.63	0.57
3.95	0.64	0.16	4.48	2.14	0.48	7.64	4.45	0.58	4.83	2.90	0.60	4.07	1.92	0.47
1.10	0.27	0.25	3.24	2.16	0.67	9.59	6.49	0.68	3.32	1.20	0.36	5.93	2.87	0.48
1.66	0.76	0.46	1.91	2.25	1.18	4.69	4.90	1.04	6.79	3.00	0.44	3.42	3.80	1.11
4.63	1.29	0.28	7.85	4.03	0.51	16.24	9.69	0.60	1.45	0.40	0.28	6.15	4.18	0.68
2.61	0.49	0.19	8.15	5.68	0.69	17.02	8.75	0.51	1.55	1.40	0.90	4.04	3.58	0.89
1.66	0.34	0.20	7.81	7.93	1.01	14.67	5.51	0.38	4.68	2.80	0.60	4.60	2.73	0.59
1.75	0.68	0.39	6.05	2.23	0.37	5.50	2.87	0.52	9.88	2.70	0.27	10.70	8.58	0.80
1.92	0.54	0.28	3.44	2.15	0.63	4.83	3.22	0.67	15.61	5.20	0.33	3.87	2.87	0.74
23.91	6.05	0.25	4.72	3.44	0.73	3.65	3.99	1.09	6.19	1.40	0.23			
2.55	0.73	0.29	2.92	1.72	0.59	12.01	9.87	0.82	4.96	2.20	0.44			
18.36	6.29	0.34	15.54	7.50	0.48	4.18	2.69	0.64	16.24	8.60	0.53			
13.91	5.87	0.42	15.55	6.90	0.44	3.12	1.59	0.51	22.35	7.80	0.35			
7.38	1.77	0.24	16.68	7.50	0.45	7.38	4.42	0.60	4.39	1.20	0.27			
6.04	1.01	0.17	15.11	7.90	0.52	1.47	0.98	0.67	8.65	5.10	0.59			
9.09	2.06	0.23	12.93	9.10	0.70	1.69	1.38	0.82	5.71	2.30	0.40			
1.74	0.10	0.06	14.25	5.70	0.40	7.79	4.81	0.62	9.69	3.20	0.33			
4.90	0.71	0.14	15.44	7.70	0.50	18.00	11.01	0.61	11.20	4.30	0.38			
12.88	4.06	0.32	4.87	2.80	0.58	17.21	9.77	0.57	9.02	2.40	0.27			
4.08	1.61	0.39	9.93	4.60	0.46	4.80	3.63	0.76	15.33	8.50	0.55			
6.08	3.04	0.50	1.49	1.00	0.67	3.87	1.73	0.45	10.01	4.40	0.44			
4.72	1.14	0.24	20.21	8.80	0.44	0.95	0.37	0.39	9.10	2.40	0.26			
1.12	0.50	0.45	0.73	0.70	0.96	3.64	1.36	0.37						
1.47	0.73	0.50	1.62	1.20	0.74	14.61	9.58	0.66						
2.87	1.21	0.42	3.60	2.40	0.67	15.06	8.46	0.56						
12.68	8.43	0.66	1.22	0.90	0.74	11.79	7.07	0.60						
10.96	4.79	0.44	4.23	1.70	0.40	4.21	2.56	0.61						
			2.70	1.20	0.44	4.30	2.06	0.47						

Table 3. Statistical summary of relationship between weight (w) and respiration rate of *O. affinis* at different temperatures. Based on data in Table 2. a) logarithmic regression of respiration rate (QO_2) on weight. b) logarithmic regression of weight specific respiration rate (QWO_2) on weight. c) Elementary statistics for mean of QWO_2 values.

		T°				
		0°	5°	10°	15°	20°
	N	50	51	51	45	32
a)	a	-0.545	-0.108	-0.154	-0.244	0.119
	b	0.994	0.826	0.935	0.854	0.709
	S.E.R.	0.082	0.040	0.044	0.081	0.069
	r^2	0.869	0.947	0.951	0.849	0.881
	S.E.E.	0.243	0.103	0.124	0.187	0.135
	QO_2(10mg)	2.812	5.224	6.039	4.074	6.730
b)	a′	-0.558	-0.108	-0.154	-0.243	0.064
	b′	0.003	-0.174	-0.066	-0.147	-0.232
	S.E.R.	0.088	0.040	0.043	0.081	0.079
	r^2	0.006	-0.528	-0.210	-0.267	-0.473
	S.E.E.	0.261	0.103	0.124	0.187	0.154
	QO_2(10mg)	2.786	5.224	6.026	4.074	6.792
c)	QWO_2	0.328	0.624	0.654	0.498	0.897
	S.D.	0.154	0.178	0.192	0.295	0.414
	S.E.M.	0.022	0.025	0.027	0.044	0.073
	C.V.	46.95	28.53	29.36	59.24	46.15

Table 4. Respiration rate (QWO_2) of O. affinis measured at different temperatures during the winter (4 - 9/3/74) by the Gilson technique (n = 4; S°/oo = 17°/oo; NSW).

	T°						
	0°	2°	5°	8°	10°	12°	15°
	0.30	0.25	0.32	0.38	0.66	0.58	0.75
	0.37	0.29	0.56*	0.40	0.63	0.41	0.69
	0.30	0.44	0.46	0.33	0.45	0.60	0.76
	0.41	0.68*	0.38	0.30	0.53	0.56	0.70
	0.19	0.22	0.36	0.37	0.39	0.52	0.71
	0.35	0.31	0.33	0.39	0.35	0.66	0.63
	0.28	0.38	0.33	0.45	0.41	0.66	0.84
	0.29	0.46	0.41	0.55	0.42	0.58	-
N	8	7	7	8	8	8	7
W	9.19	8.54	8.73	8.27	8.41	9.85	10.15
QWO_2	0.31	0.34	0.37	0.39	0.48	0.57	0.73
S.D.	0.07	0.09	0.05	0.08	0.11	0.08	0.07
S.E.M.	0.02	0.04	0.02	0.03	0.04	0.03	0.02
C.V.	22.6	26.5	13.5	20.5	22.9	14.0	9.6
C.I.(95%)	0.17	0.22	0.12	0.19	0.26	0.19	0.17

Table 5. Respiration rate (QWO_2) of *O. affinis* measured at different temperatures during early summer (10 - 19/7/74) by the Gilson technique (n = 4; S°/∘∘ = 17°/∘∘; NSW).

	T°									
	0°	2°	5°	8°	10°	12°	15°	18°	20°	22°
	0.16	0.31	0.43	0.48	0.44	0.66	0.59	0.72	0.72	0.70
	0.38	0.26	0.31	0.53	0.57	0.48	0.81	0.44	0.73	0.80
	0.28	0.24	0.34	0.36	0.53	0.67	0.78	0.58	0.84	0.85
	0.31	0.28	0.31	0.37	0.53	0.47	0.80	0.74	0.86	0.71
	0.34	0.20	0.22	0.33	0.60	0.38	0.82	0.76	0.48	0.86
	0.27	0.41	0.33	0.39	0.47	0.69	0.92	0.66	0.53	0.74
	0.30	0.37	0.40	0.48	0.46	0.43	0.75	0.90	1.00	-
	0.24	0.28	0.31	0.34	0.52	0.61	0.86	0.70	0.84	-
	-	0.22	0.54	-	0.48	0.56	-	0.62	0.88	-
N	8	9	9	8	9	9	8	9	9	6
W	8.05	8.30	7.67	8.07	7.90	6.77	7.92	6.26	6.76	5.14
QWO_2	0.29	0.29	0.35	0.41	0.51	0.55	0.79	0.68	0.76	0.78
S.D.	0.07	0.07	0.09	0.08	0.05	0.11	0.10	0.13	0.17	0.07
S.E.M.	0.02	0.02	0.03	0.03	0.02	0.04	0.03	0.04	0.06	0.03
C.V.	24.1	25.0	25.7	19.5	9.8	20.0	12.7	19.1	22.4	9.0
C.I.(95%)	0.17	0.16	0.21	0.19	0.12	0.25	0.24	0.30	0.39	0.18

Table 6. Respiration rate (QWO_2) of O. affinis measured at different temperatures during late summer (24 - 28/8/74) by the Gilson technique (n = 5; S°/₀₀ = 17°/₀₀; NSW).

	T°								
	1°	2°	5°	8°	10°	12°	15°	18°	20°
	0.25	0.24	0.53	0.49	0.75	0.67	0.83	1.02	0.93
	0.22	0.25	0.44	0.75	0.94	0.58	0.86	1.06	1.14
	0.28	0.29	0.32	0.43	0.80	0.58	0.65	0.85	0.88
	0.35	0.37	0.41	0.42	0.69	0.56	0.80	0.77	0.86
	0.29	0.36	0.47	0.54	0.81	0.70	0.91	0.77	1.01
	0.22	0.26	0.33	0.59	0.83	0.59	0.78	1.04	0.97
	0.22	0.34	0.33	0.52	0.57	0.65	0.78	1.01	0.96
	0.29	0.34	0.33	0.54	0.78	0.78	0.68	0.95	1.14
N	8	8	8	8	8	8	8	8	8
W	5.49	5.37	4.65	5.20	4.59	4.94	5.24	5.39	4.85
QWO_2	0.27	0.31	0.40	0.54	0.77	0.64	0.79	0.93	0.99
S.D.	0.05	0.05	0.08	0.10	0.11	0.08	0.09	0.12	0.11
S.E.M.	0.02	0.02	0.03	0.04	0.04	0.03	0.03	0.04	0.04
C.V.	17.4	17.0	20.3	19.4	14.0	11.9	11.1	12.8	10.8
C.I.(95%)	0.12	0.12	0.19	0.24	0.26	0.19	0.21	0.28	0.26

Table 7. Q_{10} coefficients for respiration rate - temperature relationship of O. affinis during summer and winter. Based on data in Tables 4 - 6.

winter (4 - 9/3/74)		early summer (10 - 19/7/74)		late summer (24 - 28/8/74)	
T°	Q_{10}	T°	Q_{10}	T°	Q_{10}
0- 2	1.59	0- 2	1.00	1- 2	3.98
2- 5	1.33	2- 5	1.87	2- 5	2.34
5- 8	1.19	5- 8	1.69	5- 8	2.72
8-10	2.82	8-10	2.98	8-10	5.90
10-12	2.36	10-12	1.46	10-12	0.40
12-15	2.28	12-15	3.34	12-15	2.02
0- 8	1.33	15-18	0.61	15-18	1.72
8-15	2.45	18-20	1.74	18-20	1.37
		20-22	1.14	1-10	3.20
		2-12	1.90	10-15	1.05
		15-22	0.98	15-20	1.57

Table 8. Respiration rate (QWO_2) of O. affinis, acclimated at 0°C in the laboratory, measured at different temperatures by the Gilson technique (n = 4; S°/₀₀ = 17°/₀₀; IOSW; 22/10 - 30/11/73).

	T°												
	0°	2°	4°	6°	8°	10°	12°	12°	14°	16°	16°	18°	20°
	0.14	0.31	0.21	0.22	0.12	0.30	0.34	0.55	0.60	0.62	0.44	0.56	0.60
	0.26	0.16	0.21	0.37	0.39	0.33	0.58	0.42	0.48	0.53	0.43	0.58	0.71
	0.16	0.27	0.21	0.27	0.32	0.32	0.47	0.41	0.62	0.68	0.41	0.54	0.77
	0.16	0.31	0.14	0.19	0.28	0.35	0.37	0.40	0.66	0.50	0.63	0.45	0.73
	0.23	0.23	0.31	0.20	0.31	0.41	0.53	0.46	0.64	0.58	0.43	0.60	0.58
	0.12	0.14	0.23	0.17	0.35	0.29	0.56	0.43	0.53	0.54	0.48	0.58	0.52
	0.24	0.23	0.17	0.20	0.20	0.29	0.39	0.38	0.48	0.53	0.48	0.66	0.50
	0.13	0.44*	0.14	0.24	0.23	0.29	0.54	0.34	0.54	0.47	0.53	0.60	-
	-	-	-	-	0.12	-	-	-	0.63	-	0.48	-	-
N	8	7	8	8	9	8		16	9		17	8	7
W	6.88	6.00	6.82	5.37	6.09	6.46		7.33	5.57		4.78	6.54	7.34
QWO_2	0.18	0.24	0.20	0.23	0.26	0.32		0.45	0.58		0.52	0.57	0.63
S.D.	0.05	0.07	0.06	0.06	0.10	0.04		0.08	0.07		0.08	0.06	0.11
S.E.M.	0.02	0.03	0.02	0.02	0.03	0.01		0.02	0.02		0.02	0.02	0.04
C.V.	27.8	29.2	30.0	26.1	38.5	12.5		17.8	12.07		1.54	10.5	17.5
C.I.(95%)	0.12	0.17	0.14	0.14	0.23	0.09		0.17	0.16		0.17	0.14	0.27

Table 9. Respiration rate (QWO_2) of *O. affinis*, acclimated at 12° C in the laboratory, measured at different temperatures by the Gilson technique (n = 4; S°/oo = 17°/oo; IOSW; 19/11 - 5/12/73).

	0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°
	0.17	0.16	0.27	0.26	0.36	0.22	0.30	0.32	0.57	0.63	0.70
	0.13	0.19	0.21	0.27	0.37	0.40	0.35	0.44	0.54	0.59	0.80
	0.14	0.14	0.31	0.20	0.27	0.46	0.26	0.48	0.49	0.62	0.75
	0.14	0.16	0.22	0.25	0.23	0.29	0.29	0.27	0.51	0.55	0.60
	0.10	0.19	0.20	0.28	0.26	0.27	0.32	0.36	0.47	0.47	0.65
	0.13	0.18	0.24	0.30	0.26	0.30	0.42	0.38	0.51	0.54	0.68
	0.14	0.19	0.28	0.20	0.31	0.37	0.39	0.37	0.45	0.60	0.73
	0.14	0.18	0.17	0.29	0.21	0.41	0.40	0.28	0.36	0.62	0.69
N	8	8	8	8	8	8	8	8	8	8	8
W	9.75	9.51	9.71	7.95	7.56	7.83	6.17	8.37	6.63	8.07	6.86
QWO_2	0.14	0.18	0.24	0.26	0.28	0.34	0.34	0.36	0.49	0.58	0.70
S.D.	0.02	0.02	0.05	0.04	0.06	0.08	0.06	0.07	0.06	0.06	0.06
S.E.M.	0.01	0.01	0.02	0.01	0.02	0.03	0.02	0.03	0.02	0.02	0.02
C.V.	14.3	11.1	20.8	15.4	2.14	23.5	17.6	19.4	12.2	10.3	8.6
C.I.(95%)	0.05	0.05	0.12	0.09	21.4	0.19	0.14	0.17	0.14	0.14	0.14

Table 10. Q_{10} coefficients for respiration rate - temperature relationship of O. affinis acclimated in the laboratory at 0° and 12°C. Based on data in Tables 8 - 9.

0°C acclimated		12°C acclimated	
T°	Q_{10}	T°	Q_{10}
0- 2	2.05	0- 2	3.51
2- 4	0.40	2- 4	4.21
4- 6	2.01	4- 6	1.49
6- 8	1.85	6- 8	1.45
8-10	2.82	8-10	2.64
10-12	5.50	10-12	1.00
12-14	3.56	12-14	1.33
14-16	0.58	14-16	4.67
16-18	1.58	16-18	2.32
18-20	1.65	18-20	2.56
0- 8	1.58	0-10	2.43
8-14	3.81	10-14	1.15
16-20	1.62	14-20	3.03

Table 11. Respiration rate (QWO_2) of _O. affinis_ measured by the Gilson technique at different salinities. Animals acutely exposed to the test salinities following acclimation at 17°/∘∘ (n = 4; T° = 10°C; IOSW)

	S°/∘∘						
	5	10	15	20	25	30	35
	0.43	0.54	0.39	0.44	0.28	0.22	0.21
	0.55	0.54	0.29	0.47	0.21	0.21	0.21
	0.47	0.44	0.55	0.42	0.29	0.22	0.22
	0.40	0.57	0.40	0.35	0.31	0.19	0.18
	0.40	0.42	0.34	0.37	0.30	0.19	0.19
	0.36	0.62	0.39	0.25	0.27	0.25	0.17
	0.45	0.48	0.41	0.27	0.26	0.29	0.22
	0.35	0.43	0.39	0.36	0.31	0.24	0.20
N	8	8	8	8	8	8	8
W	6.93	7.55	8.81	7.99	6.99	8.86	7.77
QWO_2	0.43	0.51	0.40	0.37	0.28	0.23	0.20
S.D.	0.06	0.07	0.07	0.08	0.03	0.03	0.02
S.E.M.	0.02	0.03	0.03	0.03	0.01	0.01	0.01
C.V.	14.0	13.7	17.5	21.6	10.7	13.0	10.0
C.I.(95%)	0.14	0.17	0.17	0.19	0.07	0.07	0.05

Table 12. Respiration rate (QWO_2) of O. affinis measured by the Gilson technique at different salinities, following acclimation for two weeks at the test salinity (n = 4; T° = 10°C; IOSW).

	S°/oo						
	5	10	15	20	25	30	35
	0.38	0.39	0.41	0.46	0.36	0.28	0.28
	0.44	0.33	0.42	0.47	0.54	0.30	0.36
	0.40	0.59	0.42	0.37	0.31	0.27	0.32
	0.41	0.30	0.56	0.43	0.47	0.31	0.33
	0.39	0.23	0.48	0.44	0.78	0.30	0.30
	0.38	0.57	0.53	0.41	0.48	0.31	0.43
	0.36	0.37	0.41	0.50	0.32	0.34	0.28
		0.54	0.42		0.23	0.42	
		0.69	0.46			0.43	
		0.30					
		0.54					
N	7	11	9	7	8	9	7
W	8.28	8.96	8.66	8.95	8.86	8.20	8.90
QWO_2	0.39	0.44	0.46	0.44	0.44	0.33	0.33
S.D.	0.03	0.15	0.06	0.04	0.17	0.06	0.05
S.E.M.	0.01	0.05	0.02	0.02	0.06	0.02	0.02
C.V.	7.7	34.1	13.0	9.1	38.6	18.2	15.2
C.I.(95%)	0.07	0.33	0.14	0.10	0.40	0.14	0.12

Table 13. Respiration rate (QO_2 and QWO_2) of O. affinis measured by the in situ technique at approximately 4 hour intervals over a two day period in July (n = 20; T° = 2.4°C; S°/₀₀ = 15.2°/₀₀; incubation depth = 20 m; incubation times indicated).

(21/7/74)

	1300-1700 h			1700-2105 h		
	W	QO_2	QWO_2	W	QO_2	QWO_2
	5.61	1.23	0.22*	4.59	2.65	0.58
	5.00	2.58	0.52	6.58	3.37	0.51
	5.19	3.50	0.67	5.88	3.20	0.54
	6.26	3.87	0.62	7.24	4.01	0.56
	5.59	3.07	0.55	5.92	2.80	0.47
	5.04	2.13	0.42	4.98	2.44	0.49
	6.84	4.34	0.63	5.46	2.19	0.40
	5.86	4.11	0.70	5.89	3.29	0.56
	7.43	4.83	0.65			
N			8			8
W			5.90			5.82
QWO_2			0.60			0.51
S.D.			0.09			0.06
S.E.M.			0.03			0.02
C.V.			15.5			11.6
C.I.(95%)			0.21			0.14

Table 13 (continued).

(21 - 22/7/74)

	2045-0045 h			0140-0530 h		
	w	QO_2	QWO_2	w	QO_2	QWO_2
	6.41	2.65	0.41	8.10	5.60	0.69
	6.40	3.80	0.59	7.74	5.85	0.76
	5.85	4.74	0.81	6.20	4.19	0.68
	5.32	4.15	0.78	6.23	4.14	0.66
	6.02	3.93	0.65	7.17	4.95	0.69
	7.93	3.88	0.49	7.55	4.92	0.65
	7.53	5.20	0.69	5.27	3.78	0.72
	5.96	4.98	0.83	6.73	4.73	0.72
	5.12	6.00	1.17*	6.64	4.68	0.70
N			8			9
W			5.43			6.85
QWO_2			0.66			0.70
S.D.			0.15			0.03
S.E.M.			0.05			0.01
C.V.			23.3			4.8
C.I.(95%)			0.35			0.07

Table 13 (continued)

(22/7/74)

	0510-0930 h			0905-1310 h		
	w	QO_2	QWO_2	w	QO_2	QWO_2
	5.85	5.72	0.98*	5.90	3.83	0.65
	8.03	4.70	0.59	5.48	3.13	0.57
	7.69	4.75	0.62	6.07	3.94	0.65
	7.70	5.25	0.68	5.28	2.51	0.48
	8.87	3.73	0.42	5.88	3.72	0.63
	7.10	3.53	0.50	4.54	2.56	0.57
	6.77	3.28	0.49	6.39	3.70	0.58
	7.66	4.72	0.62	5.97	3.84	0.64
	7.16	4.56	0.64	6.35	3.93	0.62
N			8			9
W			7.62			5.76
QWO_2			0.57			0.60
S.D.			0.09			0.06
S.E.M.			0.03			0.02
C.V.			15.7			9.2
C.I.(95%)			0.21			0.14

Table 13 (continued).

(22/7/74)

	1240-1725 h			1710-2120 h		
	W	QO_2	QWO_2	W	QO_2	QWO_2
	6.10	4.32	0.67	5.94	4.79	0.81
	7.42	2.80	0.38*	6.20	3.21	0.52
	6.21	3.78	0.61	7.05	3.92	0.56
	6.49	4.32	0.67	5.07	2.43	0.48
	6.79	4.25	0.63	6.74	4.08	0.61
	6.04	3.71	0.61	6.29	4.99	0.79
	4.75	2.87	0.60	5.70	3.90	0.69
	6.92	4.43	0.64	7.33	4.50	0.61
				7.66	4.08	0.53
N			7			9
W			6.19			6.44
QWO_2			0.63			0.62
S.D.			0.03			0.12
S.E.M.			0.01			0.04
C.V.			4.5			18.9
C.I.(95%)			0.07			0.28

Table 13 (continued).

(22 - 23/7/74)

	2105-0110 h			0100-0515 h		
	w	QO_2	QWO_2	w	QO_2	QWO_2
	6.22	4.36	0.70	7.52	6.44	0.86
	6.18	4.29	0.69	8.25	6.38	0.77
	7.92	6.67	0.84	6.69	5.42	0.81
	7.19	5.85	0.81	7.69	6.36	0.83
	7.55	6.40	0.85	7.95	6.41	0.81
	5.52	4.38	0.79	7.04	5.77	0.82
	7.24	5.69	0.79	9.96	7.88	0.79
				8.75	7.32	0.84
				7.88	6.68	0.85
N			7			9
W			6.83			7.97
QWO_2			0.78			0.82
S.D.			0.06			0.03
S.E.M.			0.02			0.01
C.V.			8.1			3.5
C.I.(95%)			0.15			0.07

Table 13 (continued).

	(23/7/74)		
	0455-0850 h		
	W	QO_2	QWO_2
	7.85	5.72	0.73
	7.36	5.42	0.74
	6.97	4.27	0.61
	6.73	4.74	0.71
	8.51	6.91	0.81
	8.45	6.34	0.75
	8.83	6.78	0.77
	9.38	6.89	0.74
	7.16	5.79	0.81
	6.72	5.25	0.78
N			10
W			7.80
QWO_2			0.75
S.D.			0.06
S.E.M.			0.02
C.V.			7.8
C.I.(95%)			0.14

Table 14. Respiration rate (QO_2 and QWO_2) of O. affinis measured by the in situ technique at approximately four hour intervals over a two day period in August (n = 20; T° 6.4°C; S°/₀₀ =14°/₀₀; incubation depth = 20 m; incubation times indicated).

(13/8/74)

	1250-1655 h			1640-2040 h		
	W	QO_2	QWO_2	W	QO_2	QWO_2
	6.86	5.07	0.74	4.72	3.45	0.73
	6.37	5.09	0.80	7.21	5.20	0.72
	6.20	5.07	0.82	5.56	3.62	0.65
	6.44	5.31	0.83	6.38	5.37	0.84
	6.91	4.36	0.63	7.54	5.17	0.69
	6.93	6.32	0.91	7.14	5.29	0.74
	6.78	4.15	0.61	6.00	4.88	0.81
	6.69	4.67	0.70	7.16	4.73	0.66
				6.92	5.75	0.83
N			8			9
W			6.65			6.51
QWO_2			0.76			0.74
S.D.			0.10			0.07
S.E.M.			0.04			0.02
C.V.			13.8			9.6
C.I.(95%)			0.24			0.16

Table 14 (continued).

(13 - 14/8/74)

	2015-0040 h			0030-0455 h		
	W	QO_2	QWO_2	W	QO_2	QWO_2
	6.81	3.64	0.54	6.32	4.98	0.79
	5.55	2.98	0.54	5.93	4.13	0.70
	8.37	4.33	0.52	7.61	6.15	0.81
	5.65	3.37	0.60	6.61	4.59	0.70
	6.00	3.63	0.61	6.78	5.81	0.86
	6.09	4.05	0.67	6.08	4.98	0.82
	5.33	3.79	0.71	5.29	4.44	0.84
	6.51	4.27	0.66	8.01	6.42	0.80
				10.90	7.77	0.71
N			8			9
W			6.29			7.06
QWO_2			0.61			0.78
S.D.			0.07			0.06
S.E.M.			0.03			0.02
C.V.			11.5			7.9
C.I.(95%)			0.17			0.14

Table 14 (continued).

(14/8/74)

	0430-0845 h			0830-1250 h		
	W	QO_2	QWO_2	W	QO_2	QWO_2
	6.72	4.95	0.74	9.32	5.49	0.59
	9.34	5.95	0.64	14.07	7.53	0.54
	6.57	5.09	0.77	8.86	5.52	0.62
	7.64	4.96	0.65	7.39	4.34	0.59
	10.88	7.91	0.73	11.76	6.30	0.54
	9.79	7.05	0.72	10.55	5.76	0.55
	8.90	6.94	0.78	7.03	5.53	0.79
	7.59	5.59	0.74	7.03	4.98	0.71
				16.18	10.31	0.64
N			8			9
W			8.43			10.24
QWO_2			0.72			0.62
S.D.			0.05			0.08
S.E.M.			0.02			0.03
C.V.			7.1			13.6
C.I.(95%)			0.12			0.18

Table 14 (continued).

(14/8/74)

	1630-2030 h		
	w	QO_2	QWO_2
	6.06	3.67	0.61
	7.61	5.01	0.66
	6.67	4.23	0.63
	6.89	4.90	0.71
	7.11	5.24	0.74
	6.85	4.99	0.73
	7.82	5.91	0.76
	6.75	4.27	0.63
N			8
W			6.97
QWO_2			0.68
S.D.			0.06
S.E.M.			0.02
C.V.			8.5
C.I.(95%)			0.14

Table 15. Respiration rate (QO_2 and QWO_2) of O. affinis measured by the polarographic technique at different times during the year at 0° and 10°C (n = 2; S°/₀₀ = 17°/₀₀; NSW; dates as indicated).

(30/7 - 2/8/73)

0°C			10°C		
w	QO_2	QWO_2	w	QO_2	QWO_2
9.81	3.90	0.40	12.07	5.70	0.47
10.43	3.60	0.35	10.06	7.30	0.73
9.07	1.65	0.18	8.72	7.80	0.89
6.29	2.50	0.40	8.57	3.85	0.45
4.35	0.65	0.15	9.75	5.60	0.57
4.01	0.95	0.24	9.99	6.05	0.61
4.33	1.20	0.28	13.12	9.45	0.72
6.63	1.75	0.26	5.17	4.65	0.90
4.33	1.15	0.27	7.16	5.60	0.78
6.12	1.70	0.28	13.48	6.95	0.52
3.96	0.95	0.24	8.53	5.65	0.66
3.06	0.88	0.25	13.66	9.40	0.69
10.36	3.75	0.36	8.97	5.40	0.60
9.85	3.51	0.36	13.45	8.95	0.67
11.89	3.90	0.33	8.67	6.20	0.72
11.35	4.45	0.39			

Table 15 (continued).

(16 - 23/8/73)

0°C			10°C		
w	QO_2	QWO_2	w	QO_2	QWO_2
18.36	6.30	0.34	11.55	7.24	0.63
13.91	5.90	0.42	12.53	9.05	0.72
9.10	2.10	0.23	6.60	5.37	0.81
12.88	4.10	0.32	8.46	3.71	0.44
6.08	3.00	0.49	13.64	10.67	0.78
10.96	4.80	0.44	9.55	7.16	0.75
5.85	1.60	0.28	7.67	4.41	0.57
7.29	1.90	0.26	18.69	10.16	0.54
17.80	5.80	0.33	13.77	8.05	0.58
11.53	4.00	0.35	7.64	4.45	0.58
10.62	4.60	0.43	9.59	6.49	0.68
13.18	4.50	0.34	16.24	9.69	0.60
8.69	2.60	0.30	17.02	8.75	0.51
6.59	1.60	0.24	12.01	9.87	0.82
15.22	3.40	0.22	7.38	4.42	0.60
9.84	1.90	0.19	7.79	4.81	0.62
			18.00	11.01	0.61
			17.21	9.77	0.57
			14.61	9.58	0.66
			15.06	8.46	0.56
			11.79	7.07	0.60

Table 15 (continued).

(2 - 4/3/74)

0°C			10°C		
w	QO_2	QWO_2	w	QO_2	QWO_2
9.29	3.51	0.38	8.40	6.55	0.80
11.52	4.63	0.40	10.10	5.36	0.53
9.90	3.81	0.38	9.29	7.41	0.80
7.35	3.04	0.41	11.52	5.97	0.52
8.29	3.19	0.39	7.35	4.87	0.66
9.04	2.69	0.30	8.29	6.65	0.80
9.72	3.26	0.34	9.04	6.32	0.70
			9.72	7.96	0.82

Table 15 (continued).

(28 - 30/5/74)

0°C			10°C		
W	QO_2	QWO_2	W	QO_2	QWO_2
5.92	1.01	0.24	12.81	6.13	0.48
15.54	3.29	0.21	8.38	3.43	0.41
8.97	1.36	0.15	7.37	2.60	0.35
10.19	2.17	0.21	10.98	5.45	0.50
9.06	2.44	0.27	16.57	8.26	0.50
17.61	3.64	0.21	13.54	5.15	0.38
8.01	2.89	0.36	10.15	4.87	0.48
12.80	2.65	0.21	5.84	2.22	0.38
11.23	3.00	0.27	10.46	3.77	0.36
8.78	2.27	0.26	11.56	5.35	0.46
22.88	4.89	0.21	9.02	3.79	0.42
6.17	1.39	0.23	8.94	3.38	0.38
8.19	2.80	0.34	8.53	3.21	0.38
8.65	2.12	0.25	20.33	8.61	0.42
13.25	4.28	0.32	7.31	3.31	0.45
11.64	3.23	0.28	14.74	6.72	0.46
8.94	2.94	0.33	9.84	4.14	0.42
7.28	2.68	0.37			
12.08	4.25	0.35			
9.28	3.19	0.34			
10.68	4.07	0.38			

Table 15 (continued).

(26 - 28/7/74)

0°C			10°C		
W	QO_2	QWO_2	W	QO_2	QWO_2
6.46	1.08	0.17	8.63	4.42	0.51
9.52	2.66	0.28	4.21	1.56	0.37
6.67	2.44	0.37	4.44	1.21	0.27
8.10	2.40	0.31	7.21	2.22	0.31
6.60	1.03	0.16	8.11	2.43	0.30
7.77	2.06	0.26	7.16	1.83	0.26
7.52	2.43	0.32	6.35	2.25	0.35
8.28	2.20	0.27	9.28	4.39	0.47
9.87	1.56	0.16	9.40	4.73	0.50
8.45	1.87	0.22	3.51	0.94	0.27
5.98	1.72	0.29	3.90	1.13	0.29
6.07	1.71	0.28	6.76	2.27	0.34
8.97	2.86	0.32	7.37	3.16	0.43
4.86	1.41	0.29	8.37	3.78	0.45
8.00	1.98	0.25	5.43	1.75	0.32
6.50	1.73	0.27	7.07	2.59	0.37
8.39	2.39	0.28	7.84	2.65	0.34
7.34	2.61	0.35	6.95	2.15	0.31
8.41	2.96	0.35			

Table 16. Statistical summary of respiration rate (QWO_2) of _O. affinis_ measured at different times during the year at 0° and 10°C by the polarographic technique. Based on data in Table 15.

Date	T°	N	W	QWO_2	S.D.	S.E.M.	C.V.	C.I.(95%)
30/7 - 2/8/73	0°	16	7.24	0.30	0.08	0.02	26.7	0.17
	10°	15	10.09	0.67	0.13	0.03	19.4	0.28
16 - 23/8/73	0°	16	11.12	0.32	0.09	0.02	28.1	0.19
	10°	21	12.23	0.63	0.10	0.02	15.9	0.21
2 - 4/3/74	0°	7	9.29	0.37	0.04	0.02	10.8	0.10
	10°	8	9.21	0.70	0.12	0.04	17.1	0.28
28 - 30/5/74	0°	21	10.82	0.28	0.07	0.02	25.0	0.15
	10°	17	11.96	0.43	0.05	0.01	11.6	0.11
26 - 28/7/74	0°	19	7.57	0.27	0.06	0.01	22.2	0.13
	10°	18	6.78	0.36	0.08	0.02	22.2	0.17

Table 17. Respiration rate (QO_2 and QWO_2) of _O. affinis_ measured by the Gilson technique at different times during the year at 0° and 10°C (S°/oo = 17°/oo; NSW; dates as indicated).

(3 - 8/3/75)

0°C					10°C				
n	ℓ	w	QO_2	QWO_2	n	ℓ	w	QO_2	QWO_2
5	9.8	4.94	1.24	0.25	5	11.7	6.80	3.68	0.54
5	12.0	9.50	1.42	0.15	5	12.3	8.81	5.92	0.67
5	13.5	12.95	2.73	0.21	5	14.1	12.62	7.56	0.59
5	11.1	7.02	0.75	0.11	5	12.9	9.13	5.46	0.59
5	12.6	8.67	1.21	0.14	5	13.9	12.05	8.12	0.67
5	10.5	7.08	2.04	0.29	5	13.8	10.80	6.48	0.60
5	9.2	5.41	1.94	0.36	5	11.5	7.26	4.68	0.64
5	11.1	8.30	2.72	0.33	5	9.4	3.83	2.24	0.58
5	14.1	13.82	3.10	0.22	5	8.2	2.69	1.66	0.61
5	12.1	8.32	0.84	0.10	5	8.8	4.57	1.88	0.41
5	13.4	11.61	3.37	0.29	5	10.2	6.60	3.28	0.50
5	10.1	6.06	1.20	0.20	5	12.2	9.58	5.16	0.54
5	8.9	4.29	1.13	0.26	5	12.3	11.06	5.82	0.53
5	12.0	9.97	1.93	0.19	5	15.4	16.42	7.20	0.44
5	9.7	6.20	1.28	0.21	5	12.6	10.01	5.80	0.58
5	12.7	10.08	2.35	0.23	5	7.0	2.45	1.32	0.54
5	9.6	6.02	0.86	0.14	5	12.9	10.15	4.22	0.42
5	11.4	7.56	1.47	0.19	5	11.6	8.66	2.66	0.31
5	14.7	19.03	4.63	0.24	5	8.8	4.07	0.96	0.24
5	12.2	8.92	2.14	0.24	5	12.0	9.00	4.72	0.52
5	10.2	6.47	2.25	0.35	5	9.7	5.47	2.52	0.46
5	11.4	6.93	1.01	0.15	5	12.9	10.05	3.36	0.33
5	7.4	1.92	0.22	0.12	5	13.8	14.33	5.92	0.41
5	13.2	9.56	1.01	0.11	5	11.0	7.81	2.76	0.41
5	13.3	11.00	1.48	0.13	5	8.8	4.11	1.48	0.36
					5	15.4	20.19	5.76	0.29
					5	11.9	9.30	5.60	0.60

Table 17 (continued).

(10 - 14/5/75)

0°C					10°C				
n	ℓ	w	QO_2	QWO_2	n	ℓ	w	QO_2	QWO_2
5	11.2	6.40	1.36	0.21	5	11.4	7.07	3.00	0.42
5	12.3	8.73	1.66	0.19	5	15.2	11.21	5.12	0.37
5	14.5	12.76	3.32	0.26	5	12.9	10.08	4.40	0.44
5	15.5	14.09	5.50	0.39	5	11.6	7.49	3.00	0.40
5	12.2	7.42	1.12	0.15	5	12.7	8.62	2.96	0.34
5	14.9	11.50	3.48	0.30	5	10.9	5.87	2.10	0.36
5	10.8	5.70	1.10	0.19	5	13.5	10.71	3.50	0.33
5	16.4	17.02	5.20	0.31	5	11.7	8.07	3.00	0.37
5	10.4	4.96	1.38	0.28	5	12.6	9.52	3.72	0.39
5	13.3	9.60	2.60	0.27	5	13.6	10.05	3.72	0.37
5	15.9	15.65	2.68	0.17	5	14.0	11.32	5.18	0.47
5	12.1	8.11	2.00	0.25	5	11.9	7.93	2.80	0.35
8	9.4	3.51	0.66	0.19	5	16.1	15.93	6.12	0.38
5	13.6	10.95	2.60	0.24	6	10.6	6.01	2.41	0.40
5	12.7	9.38	3.32	0.35	5	12.4	7.82	2.90	0.37
5	13.0	8.27	2.40	0.29	5	15.4	14.44	5.18	0.37
5	13.9	10.41	2.04	0.20	6	10.1	5.70	1.40	0.29
5	13.7	9.96	2.76	0.28	5	13.0	8.92	3.02	0.34
5	12.3	9.54	2.58	0.27	5	12.1	7.85	3.52	0.45
6	10.4	4.92	1.05	0.21	5	14.1	13.14	6.20	0.47
5	12.7	9.03	2.06	0.24	5	12.1	7.38	2.72	0.37
5	15.4	12.46	2.98	0.24	5	12.7	9.49	3.94	0.42
6	11.3	5.86	0.88	0.15	5	14.2	11.29	4.42	0.39
5	16.2	14.93	3.24	0.22	8	10.6	5.46	1.85	0.34
5	14.4	10.21	1.56	0.15	5	13.5	9.82	3.92	0.40
5	13.1	8.65	1.74	0.20	5	12.0	8.88	4.08	0.46
					6	12.3	8.92	3.38	0.38

Table 17 (continued).

(13 - 18/7/75)

0°C					10°C				
n	ℓ	w	QO_2	QWO_2	n	ℓ	w	QO_2	QWO_2
7	9.8	4.94	1.04	0.21	4	16.1	17.31	4.55	0.26
6	11.6	7.28	2.93	0.40	6	9.6	4.93	2.45	0.50
9	7.7	2.29	0.41	0.18	7	10.3	6.11	2.94	0.48
6	11.0	6.82	1.83	0.27	5	13.5	11.13	5.04	0.45
5	10.9	8.96	3.36	0.38	6	10.6	6.90	2.68	0.39
5	13.6	11.41	3.12	0.27	13	8.3	3.00	1.28	0.42
5	10.9	8.78	3.44	0.39	8	7.4	2.26	1.19	0.52
5	13.1	10.23	3.96	0.39	7	11.4	6.81	2.66	0.39
7	10.1	6.60	1.69	0.26	7	13.4	10.78	4.29	0.40
6	9.6	4.42	1.92	0.43	5	11.6	7.75	5.16	0.67
5	12.4	9.05	3.24	0.36	5	11.1	6.19	3.54	0.57
6	11.5	7.90	2.92	0.37	6	11.2	7.36	4.33	0.59
6	11.3	6.58	2.42	0.37	5	10.1	5.56	2.66	0.48
5	13.4	12.94	4.42	0.34	6	10.4	4.60	1.88	0.41
6	11.0	6.57	2.88	0.44	5	11.5	8.84	4.72	0.53
6	11.9	9.22	3.52	0.38	5	10.7	6.95	2.90	0.42
7	10.4	5.79	1.84	0.32	5	13.0	10.66	4.66	0.44
5	12.9	9.49	2.46	0.26	7	7.6	2.56	1.23	0.48
7	9.4	4.29	0.79	0.18	9	8.1	2.38	0.84	0.35
5	12.5	10.33	2.70	0.26	5	14.0	11.87	6.80	0.57
5	12.1	9.12	2.70	0.30	8	9.2	3.54	1.23	0.35
9	8.2	2.63	0.41	0.16	5	11.4	7.58	1.96	0.26
5	13.7	11.38	2.64	0.23	5	13.6	11.17	2.74	0.25
6	11.7	6.83	1.60	0.23	5	10.0	5.21	2.34	0.45
6	10.7	5.85	1.92	0.33	6	11.7	7.35	1.90	0.26
5	12.3	8.11	3.10	0.38	5	11.4	8.54	2.88	0.34
5	13.8	12.74	2.52	0.20	5	11.6	8.28	1.92	0.23
6	10.2	5.37	1.87	0.35					
9	8.0	2.48	0.76	0.30					
5	12.6	10.23	3.34	0.33					
6	10.6	5.29	1.02	0.19					
6	11.0	5.88	1.78	0.30					
5	12.6	9.74	3.82	0.39					
6	11.5	6.08	1.55	0.26					
6	11.1	6.48	1.68	0.26					

Table 17 (continued).

(12 - 17/8/75)

0°					10°				
n	ℓ	w	QO_2	QWO_2	n	ℓ	w	QO_2	QWO_2
3	16.3	17.30	2.90	0.17	3	17.5	18.31	9.70	0.53
6	10.1	5.06	0.67	0.13	8	8.0	2.82	1.20	0.43
5	11.8	7.70	2.82	0.37	5	11.3	9.05	3.04	0.34
4	13.7	10.38	3.95	0.38	6	10.2	5.38	2.53	0.47
5	12.1	7.16	1.56	0.22	4	12.8	9.64	6.63	0.69
5	11.9	7.18	2.02	0.28	5	10.9	6.52	3.74	0.57
4	12.7	9.51	2.78	0.29	6	9.3	4.28	2.30	0.54
6	10.0	4.58	1.55	0.34	5	11.0	7.21	2.68	0.37
3	17.9	16.60	5.83	0.35	4	13.5	10.12	4.88	0.48
7	8.7	3.42	1.67	0.49	4	12.7	10.46	3.75	0.36
4	13.9	10.18	4.28	0.42	8	7.5	2.82	1.33	0.47
6	10.3	5.40	2.07	0.38	6	10.0	5.77	2.50	0.43
6	11.1	6.62	2.15	0.32	5	12.3	9.23	5.10	0.55
6	10.5	6.18	2.58	0.42	6	10.6	6.36	2.53	0.40
4	12.9	9.39	1.73	0.18	8	8.2	3.30	1.34	0.40
5	11.3	7.56	2.58	0.34	5	12.9	10.78	4.52	0.42
4	12.8	9.88	4.10	0.42	6	10.3	6.15	2.83	0.46
3	16.0	14.83	2.77	0.19	5	11.9	8.25	4.46	0.54
8	8.2	2.88	0.75	0.26	4	13.4	10.97	6.05	0.55
8	8.0	2.89	0.68	0.23	8	8.5	2.96	1.30	0.44
3	15.4	16.16	5.13	0.32	4	12.6	8.19	3.30	0.40
5	11.2	6.78	1.92	0.28	5	10.2	5.07	1.83	0.43
4	13.3	8.90	3.75	0.42	6	11.0	5.49	2.68	0.49
5	10.9	7.48	1.44	0.19	3	16.3	14.51	9.17	0.63
6	10.8	5.68	2.07	0.36	6	10.5	4.41	2.20	0.50
5	11.3	6.89	2.16	0.31	5	11.6	6.81	4.10	0.60
					8	7.5	2.75	1.09	0.40

Table 17 (continued).

(27/2 - 2/3/76)

0°C					10°C				
n	ℓ	w	QO_2	QWO_2	n	ℓ	w	QO_2	QWO_2
5	11.8	8.92	3.54	0.40	5	12.7	11.81	10.12	0.86
5	13.2	11.49	3.54	0.31	5	11.6	8.12	7.14	0.88
5	11.2	8.18	2.30	0.28	5	13.4	12.40	5.80	0.47
5	12.2	9.94	2.68	0.27	5	10.9	7.40	3.74	0.51
5	12.5	10.09	3.16	0.31	5	12.8	11.00	6.96	0.63
5	11.9	9.35	2.70	0.29	5	12.1	9.90	6.14	0.62
5	13.3	11.33	5.06	0.45	5	12.3	9.47	6.80	0.72
5	12.4	8.40	2.20	0.26	5	11.7	9.53	4.74	0.50
5	11.0	7.74	2.68	0.35	6	13.0	11.51	6.77	0.59
5	10.3	6.86	2.00	0.29	5	11.6	8.99	4.68	0.52
5	11.7	9.29	3.12	0.34	5	12.8	13.22	8.92	0.67
5	12.0	9.29	2.28	0.25	5	11.9	8.99	4.40	0.49
5	10.6	7.84	2.56	0.33	5	13.3	12.55	8.40	0.67
5	12.2	10.79	4.06	0.38	5	10.9	7.30	4.40	0.60
5	13.0	12.56	4.50	0.36	5	11.2	8.66	6.32	0.73
5	11.1	8.04	2.60	0.32	5	13.4	12.04	6.80	0.56
5	12.9	9.40	4.42	0.47	5	12.0	9.26	8.92	0.96
5	10.6	7.27	2.02	0.28	5	13.8	13.01	8.66	0.67
5	13.2	10.12	2.02	0.20	5	12.0	9.03	5.12	0.57
5	12.2	8.93	3.64	0.41	5	11.3	8.59	4.84	0.56
					5	11.2	6.60	3.34	0.51
					5	12.7	10.81	6.22	0.58
					5	11.5	7.32	2.70	0.37
					5	13.3	11.35	5.72	0.50
					5	11.9	9.21	6.24	0.68

Table 18. Statistical summary of weight specific respiration rate (QWO_2) of _O. affinis_ measured by Gilson respirometry at different times during the year at 0° and 10°C. Based on data in Table 17.

	T°	N	W	QWO_2	S.D.	S.E.M.	C.V.	C.I.(95%)
3 - 8/3/75	0°	25	8.47	0.21	0.08	0.02	38.1	0.16
	10°	27	8.81	0.50	0.12	0.02	24.0	0.25
10 - 14/5/75	0°	26	9.62	0.24	0.06	0.01	25.0	0.13
	10°	27	9.22	0.39	0.04	0.01	10.3	0.08
13 - 18/7/75	0°	35	7.49	0.30	0.08	0.01	26.7	0.16
	10°	27	7.25	0.42	0.11	0.02	26.2	0.22
12 - 17/8/75	0°	26	8.33	0.31	0.09	0.02	29.0	0.18
	10°	27	7.32	0.48	0.09	0.02	18.8	0.19
27/2 - 2/3/76	0°	20	9.29	0.33	0.07	0.02	21.2	0.15
	10°	25	9.92	0.62	0.14	0.03	22.6	0.29

Table 19. Statistical summary of logarithmic regression of respiration (QO_2) on animal length (ℓ) for <u>O. affinis</u> at different times during the year at 0° and 10°C. Based on data in Table 17.

Date	T°	N	ℓ	a	b	S.E.R.	r^2	S.E.E.	QO_2(10mm)
3 - 8/3/75	0°	25	7.4 - 14.7	-2.40	2.45	0.60	0.65	0.21	1.12
	10°	27	7.0 - 15.4	-2.24	2.66	0.25	0.91	0.11	2.60
10 - 14/5/75	0°	26	9.4 - 16.4	-3.05	3.02	0.38	0.85	0.12	0.94
	10°	27	10.1 - 16.1	-2.42	2.68	0.27	0.90	0.07	1.83
13 - 18/7/75	0°	35	7.7 - 13.7	-3.30	3.44	0.38	0.85	0.14	1.39
	10°	27	7.4 - 16.1	-1.98	2.31	0.33	0.81	0.14	2.16
12 - 17/8/75	0°	26	8.0 - 17.9	-2.09	2.27	0.34	0.81	0.15	1.51
	10°	27	7.5 - 17.5	-2.32	2.70	0.16	0.96	0.08	2.36
27/2 - 2/3/76	0°	20	10.3 - 13.3	-1.91	2.21	0.68	0.61	0.10	1.98
	10°	25	10.9 - 13.8	-2.45	2.97	0.74	0.64	0.11	3.27

Table 20. Q_{10} coefficients for respiration of O. affinis measured at different times during the year by polarographic (P) and Gilson (G) techniques. Gilson data presented both in terms of the weight specific respiration rate (QWO_2) and the calculated rate for a standard animal [QO_2(10mm)]. Based on data in tables 15 - 19.

P(QWO_2)	30/7 - 2/8/73	0.30	0.67	2.23
	16 - 23/8/73	0.32	0.63	1.97
	2 - 4/3/74	0.37	0.70	1.89
	28 - 30/5/74	0.28	0.43	1.53
	26 - 28/7/74	0.27	0.36	1.33
				$\bar{X}$ = 1.79
G(QWO_2)	3 - 8/3/75	0.21	0.50	2.38
	10 - 14/5/75	0.24	0.39	1.63
	13 - 18/7/75	0.30	0.42	1.40
	12 - 17/8/75	0.31	0.48	1.55
	27/2 - 2/3/76	0.33	0.62	1.88
				$\bar{X}$ = 1.77
G[QO_2(10mm)]	3 - 8/3/75	1.12	2.60	2.32
	10 - 14/5/75	0.94	1.83	1.95
	13 - 18/7/75	1.39	2.16	1.55
	12 - 17/8/75	1.51	2.36	1.56
	27/2 - 2/3/76	1.98	3.27	1.65
				$\bar{X}$ = 1.81

Table 21. Respiration rate (QWO_2) of _O. affinis_ measured by the in situ technique at different times during the year [n=5; T° and S°/₀₀ = ambient as indicated; NSW; incubation depth = 20 m; incubation time (t_i) as indicated].

	1974				1975			
	2/3	25/5	13/7	9/8	27/2	7/5	16/7	13/8
	0.49	0.51	0.37	0.75	0.36	0.57	0.27	0.47
	0.47	0.46	0.39	0.51	0.43	0.51	0.31	0.57
	0.47	0.49	0.49	0.65	0.35	0.54	0.32	0.66
	0.52	0.40	0.48	0.66	0.34	0.63	0.45	0.52
	0.46	0.39	0.47	0.66	0.40	0.60	0.29	0.40
	0.52	0.52	0.41	0.63	0.43	0.62	0.38	0.51
	0.46	0.54	0.34	0.73	0.40	0.57	0.28	0.40
	0.45	0.42	0.45	0.50	0.47	0.57	0.36	0.46
	0.46	0.65	0.36	0.56	0.51	0.35	0.39	0.45
	0.47		0.42	0.70	0.48	0.41	0.39	0.44
	0.49			0.60	0.35	0.44	0.40	0.38
	0.51			0.76		0.49	0.34	0.39
				0.59		0.33		0.37
				0.59		0.43		0.44
						0.52		0.36
						0.41		0.35
						0.42		0.47
						0.42		0.36
						0.44		0.50
N	12	9	10	14	11	19	12	19
W	9.96	10.56	11.59	5.92	8.80	9.29	7.75	7.89
QWO_2	0.48	0.49	0.42	0.64	0.41	0.49	0.35	0.45
S.D.	0.02	0.08	0.05	0.08	0.06	0.09	0.06	0.08
S.E.M.	0.01	0.03	0.02	0.02	0.02	0.02	0.02	0.02
C.V.	4.2	16.3	11.9	12.5	14.6	18.4	17.1	17.8
C.I.(95%)	0.04	0.18	0.11	0.17	0.13	0.19	0.13	0.17
T°	-0.8	-0.8	0.2	6.4	-0.8	-0.8	-	7.7
S°/₀₀	14.8	18.1	17.4	14.0	14.3	17.2	-	17.0
t_i(h)	28.5	26.5	24	24	24.5	24	34	22.5

Table 22. Effect of maintenance in the laboratory at 5°C for 18 - 20 days on the respiration rate (QO_2 and QWO_2) of _O. affinis_ measured by the Gilson technique (T° = 8°C; S°/°° = 15°/°°; NSW).

<48 h				18 - 20 days				18 - 20 days			
n	w	QO_2	QWO_2	n	w	QO_2	QWO_2	n	w	QO_2	QWO_2
4	8.56	4.68	0.55	5	10.56	2.86	0.27	10	4.83	0.92	0.19
5	10.69	6.22	0.58	5	17.51	7.90	0.45	5	10.87	3.10	0.29
8	5.22	2.81	0.54	8	4.51	1.10	0.24	5	12.11	2.62	0.22
8	5.20	3.08	0.59	6	8.81	3.45	0.39	5	10.14	3.88	0.38
7	7.51	3.24	0.43	6	9.18	2.38	0.26	6	7.63	2.53	0.33
7	7.73	2.79	0.36	6	7.85	2.02	0.26	9	4.37	1.07	0.24
12	2.66	1.30	0.49	10	3.38	1.03	0.30	8	5.08	1.20	0.24
12	2.72	1.06	0.40	10	3.49	1.16	0.33	7	4.36	0.97	0.22
12	2.61	1.18	0.45	13	1.91	0.60	0.31	5	14.35	4.10	0.29
5	12.71	7.80	0.61	8	5.86	1.71	0.29	5	13.45	4.10	0.30
5	16.54	10.00	0.60	8	5.07	1.44	0.28	10	3.22	0.80	0.25
11	4.12	2.05	0.50	8	5.65	1.44	0.25	12	3.42	1.11	0.32
11	4.51	1.77	0.39	8	4.54	1.06	0.23	6	7.81	2.25	0.29
10	5.15	2.07	0.40	5	11.67	3.86	0.33	6	8.24	1.55	0.19
8	8.10	4.19	0.52	10	4.40	1.15	0.26	11	4.00	0.86	0.22
12	4.25	2.10	0.49	8	7.18	1.40	0.19	6	10.69	2.60	0.24
12	3.91	1.93	0.49	5	13.47	3.80	0.28				

Table 23. Statistical summary of effect of maintenance in the laboratory on the respiration rate of *O. affinis*. Based on data in Table 22.

	<48 hours	17 - 20 days
N	17	33
W	2.61 - 16.54	1.91 - 17.51
QWO_2	0.49	0.28
S.D.	0.08	0.06
S.E.M.	0.02	0.01
C.V.	16.3	21.4
C.I.(95%)	0.17	0.12
a	-0.426	-0.637
b	1.150	1.087
S.E.R.	0.068	0.067
r^2	0.975	0.946
S.E.	0.065	0.088
QO_2(10mg)	5.30	2.82

Table 24. Effect of short-term starvation and refeeding on the respiration rate (QO_2 and QWO_2) of O. affinis measured by the Gilson technique. Animals starved between 0 and 96 h, then refed after the 96 h determination (n = 5 - 6; T° = 10°C; S°/₀₀ = 17°/₀₀; IOSW).

	0 h			24 h			48 h		
	W	QO_2	QWO_2	W	QO_2	QWO_2	W	QO_2	QWO_2
	8.17	4.94	0.60	8.41	3.01	0.36	8.03	2.26	0.28
	9.27	3.88	0.42	8.55	2.75	0.32	7.57	2.87	0.38
	10.24	5.24	0.51	7.00	2.15	0.31	8.20	2.05	0.25
	8.37	2.90	0.35	8.97	2.63	0.29	8.79	3.46	0.39
	10.22	4.20	0.41	11.01	3.43	0.31	8.20	2.38	0.29
	8.07	3.22	0.40	9.80	3.43	0.35	12.20	2.80	0.23
	10.59	4.68	0.44	11.62	3.23	0.28	14.22	3.12	0.22
	9.50	4.24	0.45	11.31	3.05	0.27	9.48	2.46	0.26
	10.91	4.88	0.45	11.76	4.33	0.37	10.74	3.25	0.30
	9.78	4.06	0.42	9.53	2.12	0.22	9.33	1.88	0.20
	8.85	4.68	0.53				10.49	2.40	0.23
	9.13	3.10	0.34						
	8.64	2.88	0.33						
	9.13	3.46	0.38						
N	14	14	14	10	10	10	11	11	11
$\bar{X}$	9.35	4.03	0.43	9.80	3.01	0.31	9.75	2.63	0.28
S.D.		0.80	0.08		0.66	0.05		0.51	0.06
S.E.M.		0.21	0.02		0.21	0.01		0.15	0.02
C.V.		19.9	17.6		21.9	14.8		19.4	22.6
C.I.(95%)		1.73	0.17		1.49	0.11		1.14	0.13

Table 24 (continued).

	72h			96h			120h		
	w	QO_2	QWO_2	w	QO_2	QWO_2	w	QO_2	QWO_2
	9.74	2.01	0.21	10.61	2.98	0.28	9.14	3.58	0.39
	7.76	1.91	0.25	11.49	4.08	0.35	10.13	4.62	0.46
	7.60	1.75	0.23	8.88	2.37	0.27	11.01	4.47	0.41
	9.43	2.48	0.26	7.85	1.93	0.25	7.80	2.68	0.34
	10.05	2.48	0.24	8.96	1.97	0.22	9.38	2.58	0.27
	8.73	2.10	0.24	8.65	2.03	0.24	7.30	2.03	0.28
	11.78	3.37	0.29	10.83	2.08	0.19	7.62	3.48	0.46
	11.30	2.47	0.22	10.37	2.96	0.29	8.94	3.73	0.42
	9.00	2.72	0.30				11.15	4.73	0.42
	9.55	2.67	0.28				6.80	2.77	0.41
N	10	10	10	8	8	8	10	10	10
$\overline{X}$	9.54	2.40	0.25	9.71	2.55	0.26	8.93	3.47	0.39
S.D.		0.48	0.03		0.75	0.05		0.94	0.07
S.E.M.		0.15	0.01		0.27	0.02		0.30	0.02
C.V.		20.0	11.9		29.4	18.6		27.1	17.5
C.I.(95%)		1.08	0.07		1.77	0.12		2.12	0.16

Table 25. Influence of sex and reproductive condition (gravid or non-gravid) on the respiration rate (QO_2 and QWO_2) of adult O. affinis measured by the Gilson technique (n = 5; T° = 10°C; S°/₀₀ = 16°/₀₀; IOSW).

	male			female			gravid female		
	W	QO_2	QWO_2	W	QO_2	QWO_2	W	QO_2	QWO_2
	12.58	6.88	0.55	11.52	5.96	0.52	10.45	5.67	0.54
	10.17	5.73	0.56	11.80	6.17	0.52	12.47	5.78	0.46
	10.71	6.27	0.59	13.01	5.87	0.45	11.52	6.37	0.55
	11.39	3.97	0.35	11.86	4.91	0.41	12.21	3.54	0.29
	9.43	3.33	0.35	10.89	5.00	0.46	10.75	4.17	0.39
	9.68	4.20	0.43	11.18	6.00	0.54	12.08	4.74	0.39
	9.13	3.51	0.38	8.57	2.80	0.33	12.92	4.20	0.33
	7.82	2.53	0.32	12.38	6.00	0.48	10.73	3.71	0.35
	9.02	3.33	0.37	10.66	4.87	0.46	11.76	4.33	0.37
	9.09	2.57	0.28	6.57	1.87	0.28	12.65	3.53	0.28
	10.75	3.47	0.32	11.69	5.80	0.50	12.18	4.80	0.39
	9.35	3.13	0.33	11.38	4.27	0.38	14.37	6.60	0.46
				11.10	3.20	0.29	12.58	4.71	0.37
							11.30	3.80	0.34
							11.78	4.00	0.34
N	12	12	12	13	13	13	15	15	15
$\bar{X}$	9.93	4.08	0.40	10.97	4.82	0.43	11.98	4.66	0.39
S.D.		1.44	0.11		1.41	0.09		1.01	0.08
S.E.M.		0.42	0.03		0.39	0.02		0.26	0.02
C.V.		35.3	27.5		29.3	20.9		21.7	20.5
C.I.(95%)		3.17	0.24		3.05	0.19		2.15	0.17

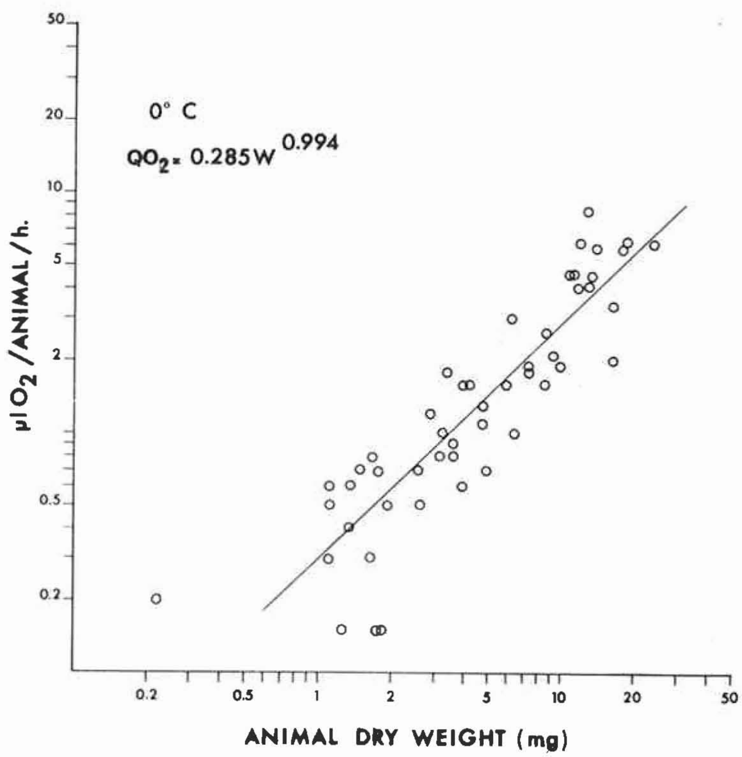

Figure 1. Weight-metabolic rate relationship for O. affinis at 0°C. Based on data in Table 2. Regression equation for line indicated.

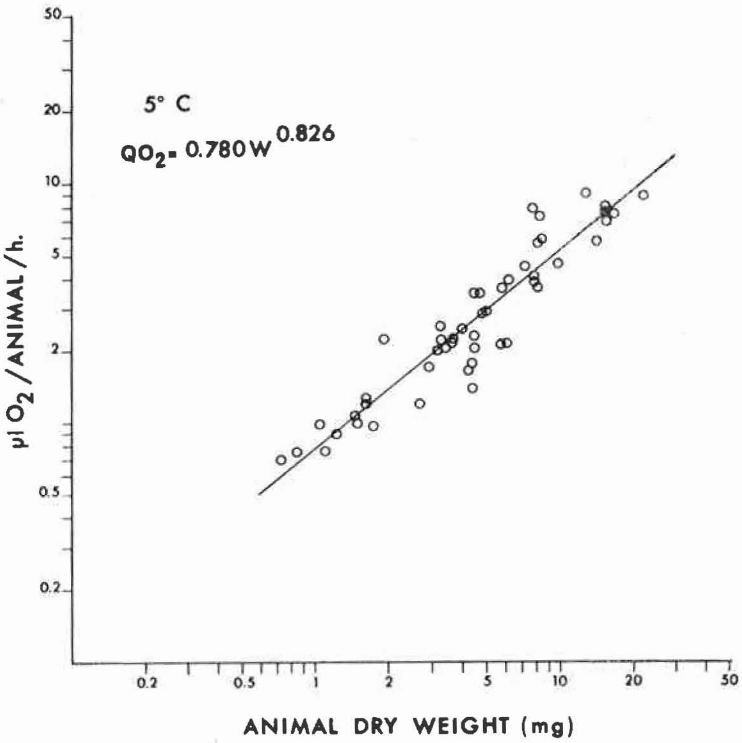

Figure 2. Weight-metabolic rate relationship for O. *affinis* at 5°C. Based on data in Table 2.

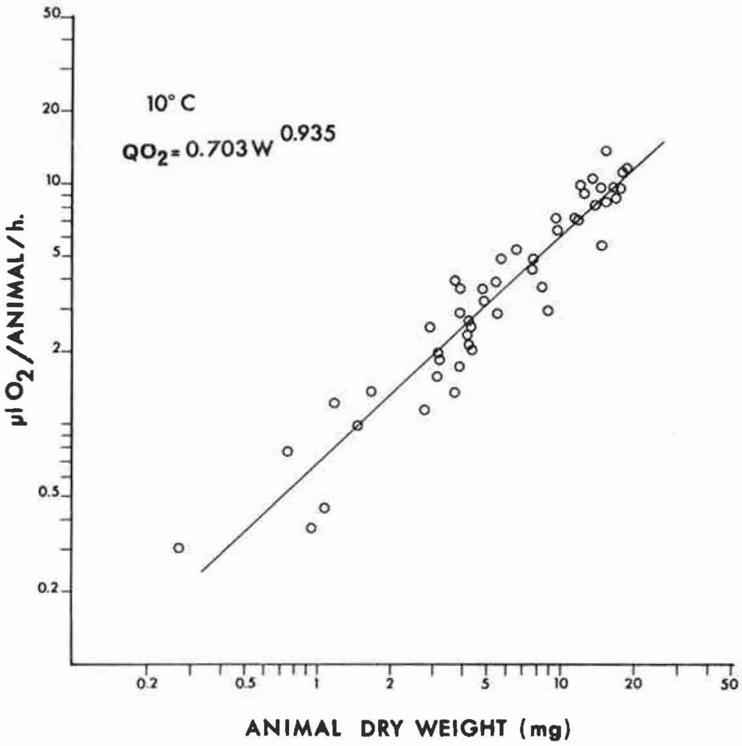

Figure 3. Weight-metabolic rate relationship for O. affinis at 10°C. Based on data in Table 2.

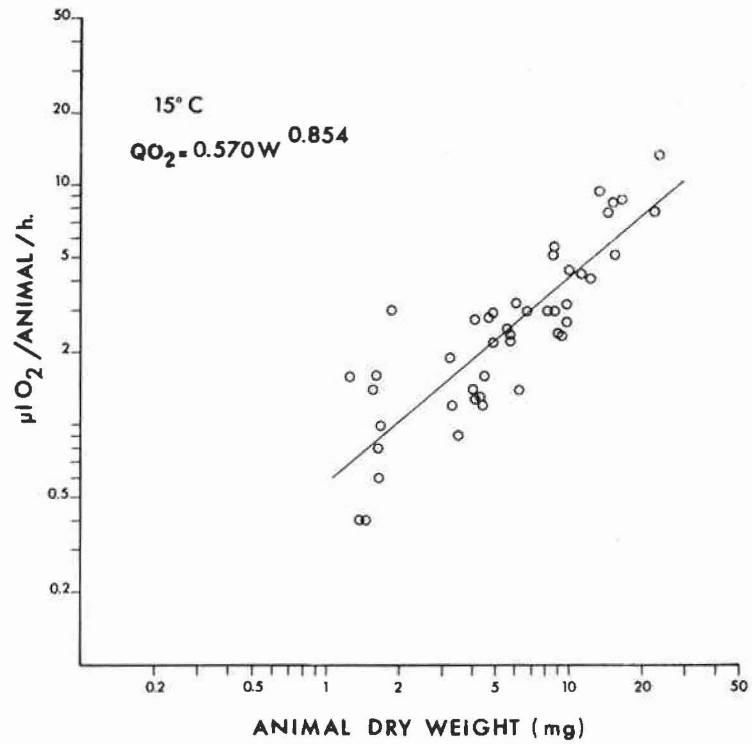

Figure 4. Weight-metabolic rate relationship for O. affinis at 15°C. Based on data in Table 2.

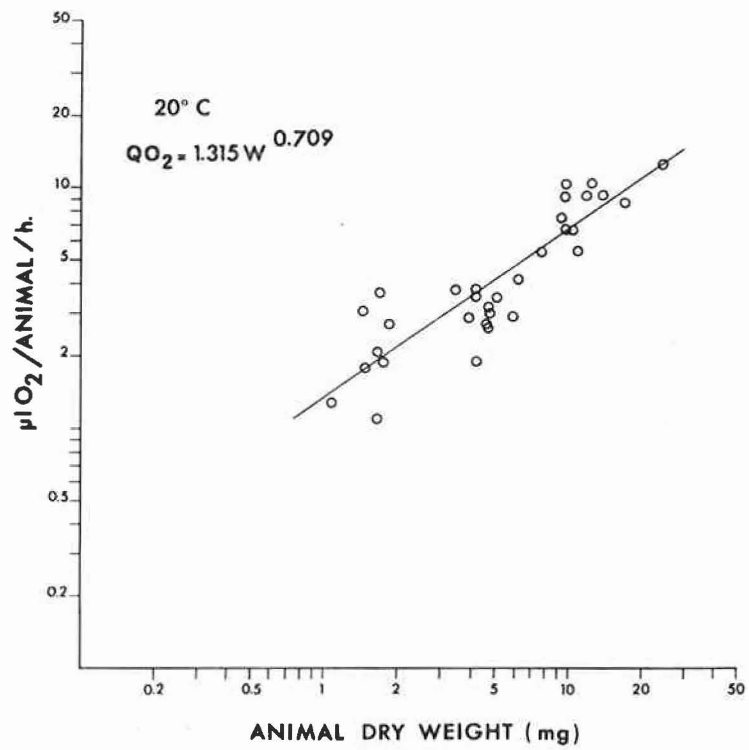

Figure 5. Weight-metabolic rate relationship for O. affinis at 20°C. Based on data in Table 2.

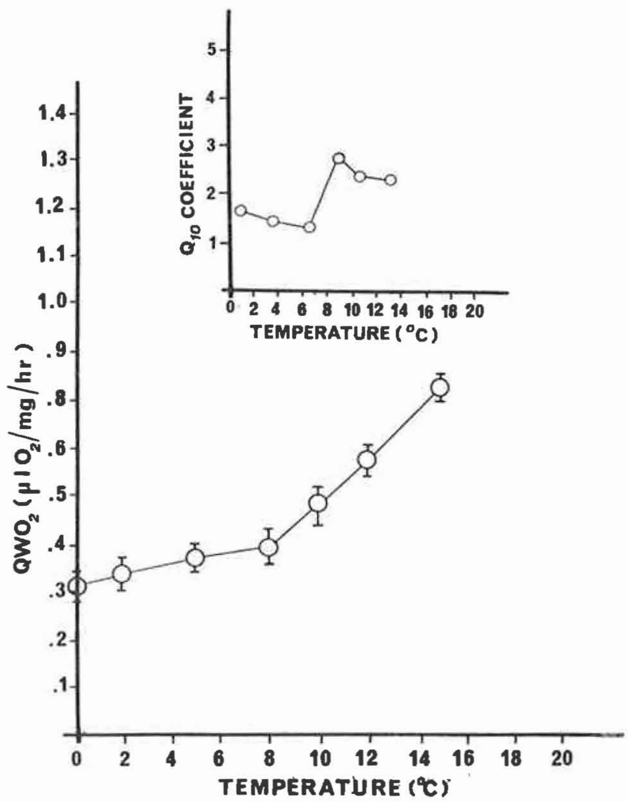

Figure 6. Metabolic rate-temperature relationship for O. *affinis* during the winter. Based on data in Table 4.

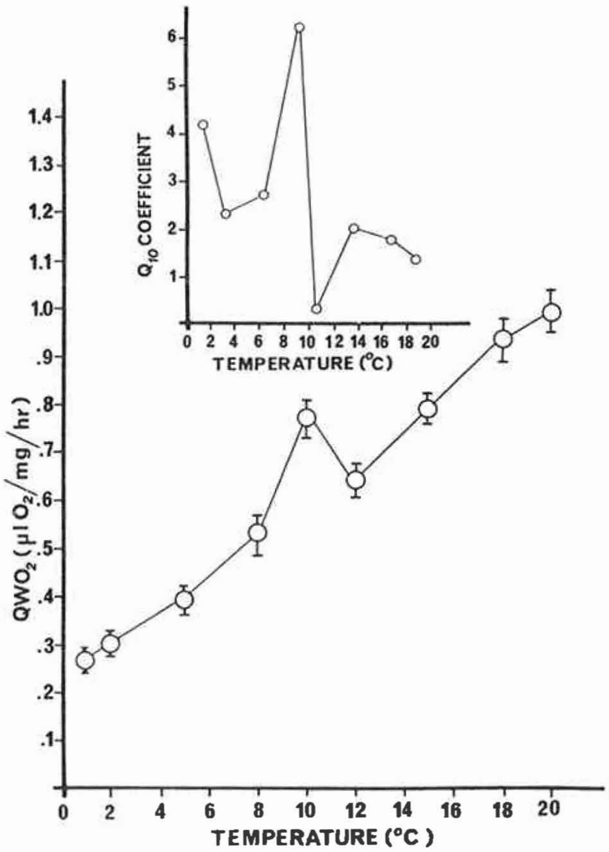

Figure 7. Metabolic rate-temperature relationship for O. affinis during the summer. Based on data in Table 6.

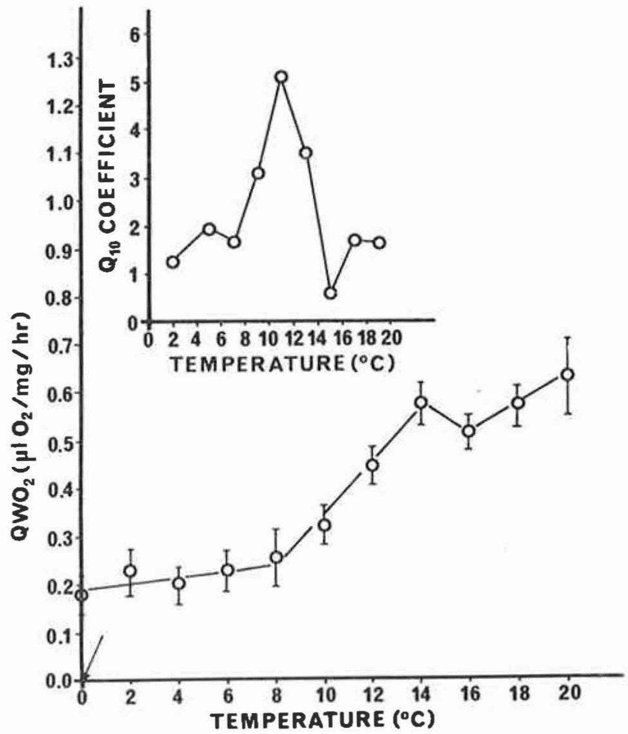

Figure 8. Metabolic rate-temperature relationship for O. *affinis* acclimated at 0°C in the laboratory. Based on data in Table 8.

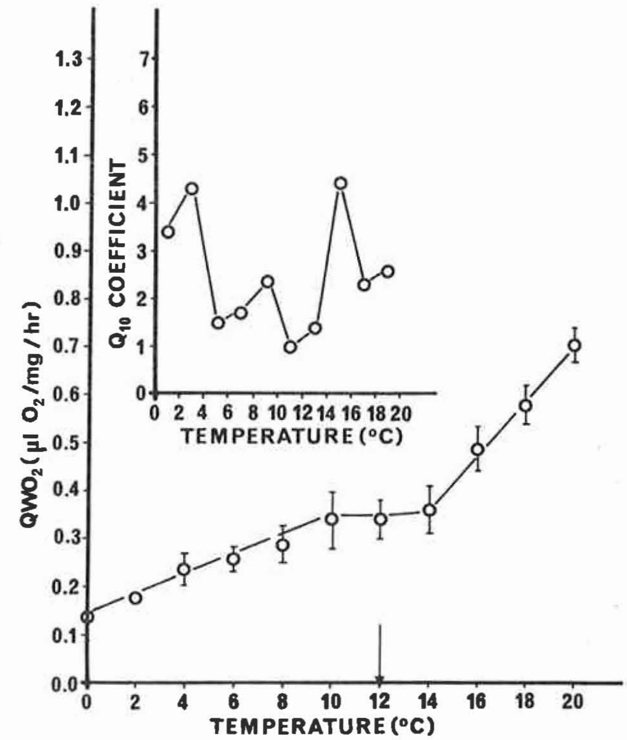

Figure 9. Metabolic rate-temperature relationship for O. affinis acclimated at 12°C in the laboratory. Based on data in Table 9.

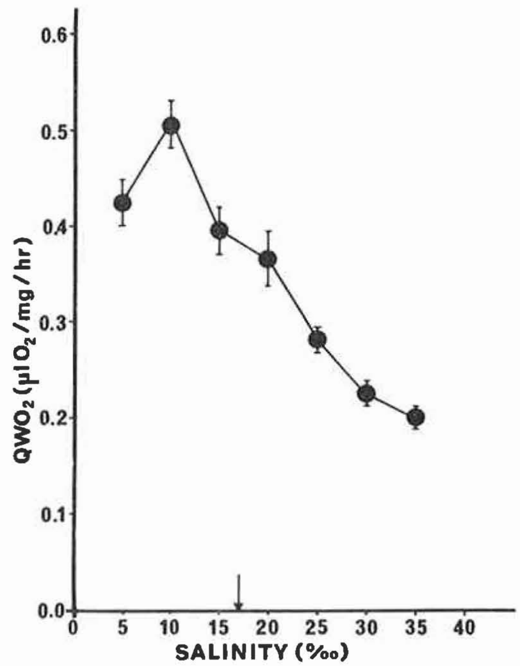

Figure 10. Respiration rate of O. affinis at different salinities following acute exposure. Based on data in Table 11.

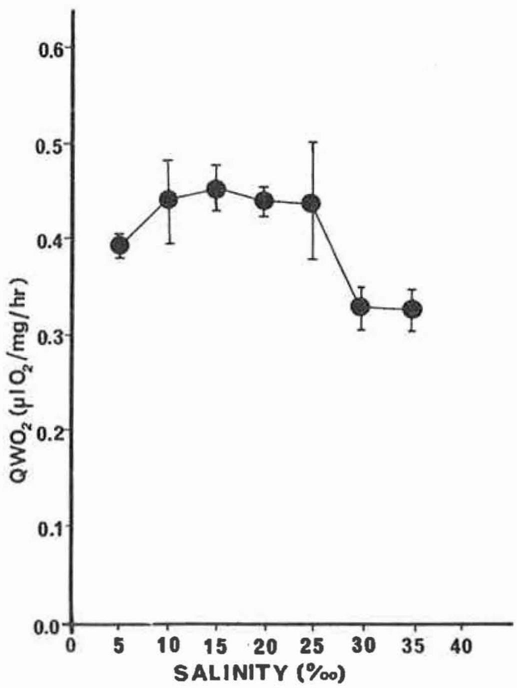

Figure 11. Respiration rate of O. affinis at different salinities following acclimation to the experimental salinities. Based on data in Table 12.

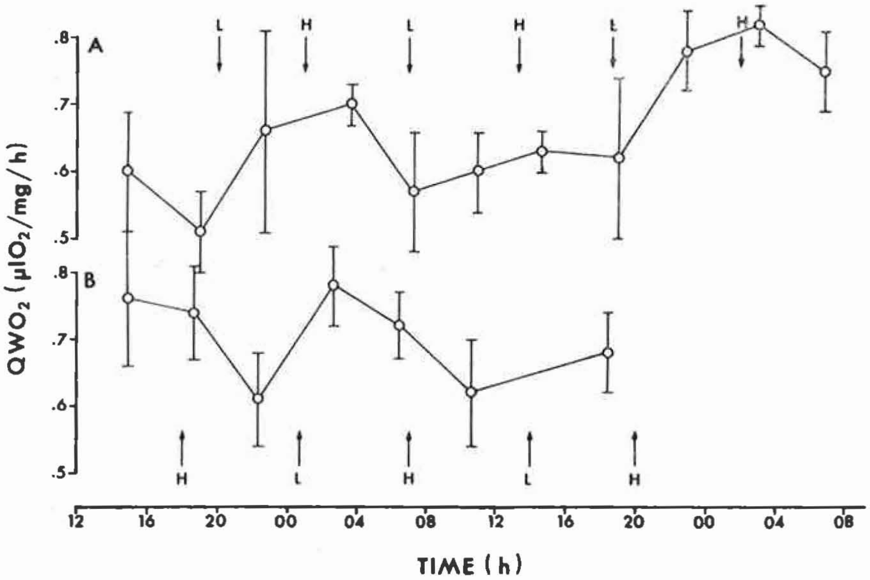

Figure 12. Respiration rate of O. affinis measured in situ at approximately 4-hour intervals over a two day period. a) July 21-22, b) August 13-14. Times of high and low tides indicated by arrows. Based on data in Tables 13 and 14.

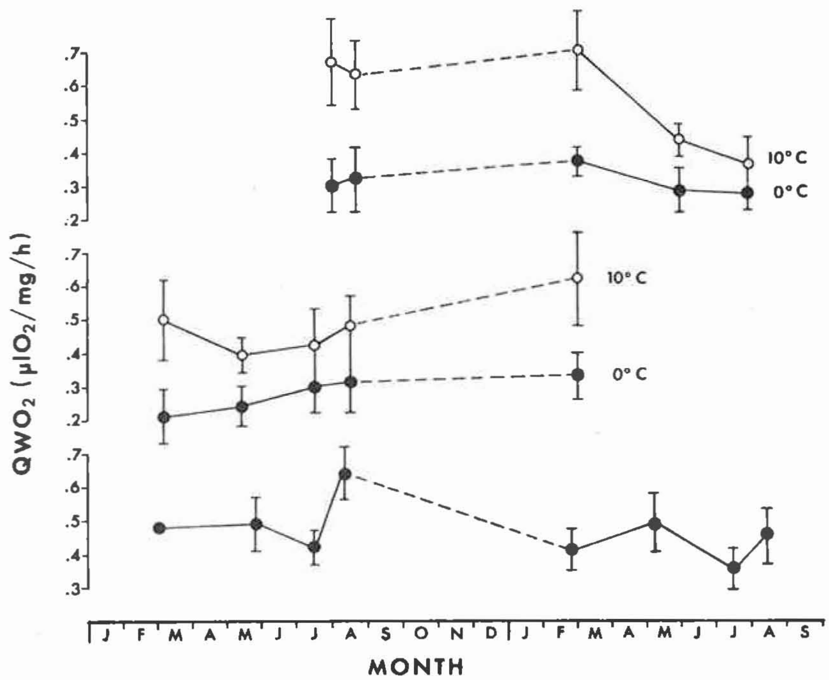

Figure 13. Respiration rate of O. affinis measured at intervals throughout the year a) Polarographic at 0° and 10°C; b) Gilson technique at 0° and 10°C; c) in situ technique at prevailing habitat temperature. Based on data in Tables 15, 17 and 21.

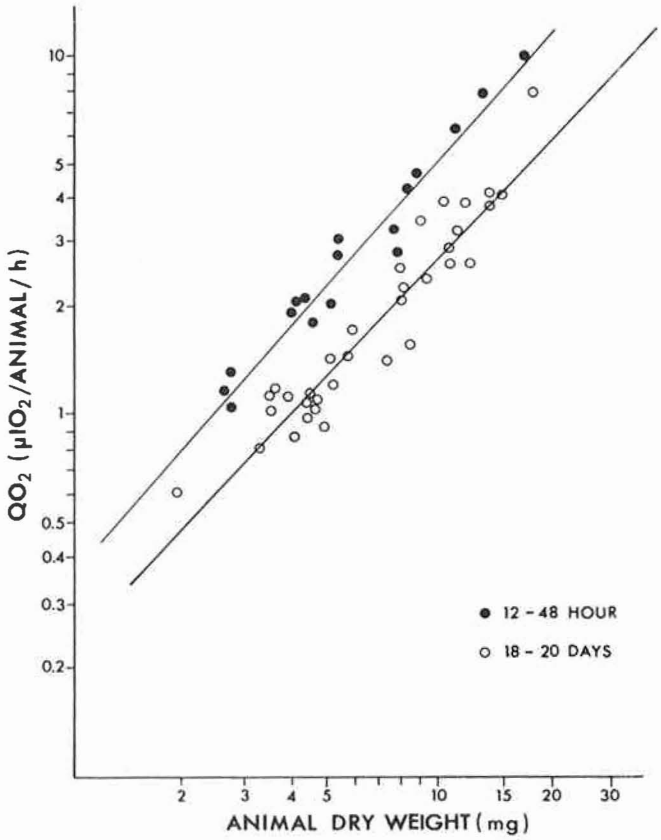

Figure 14. Regression of metabolic rate on weight for O. affinis following maintenance in the laboratory for a) 12-48 hours and b) 18-20 days. Based on data in Table 22.

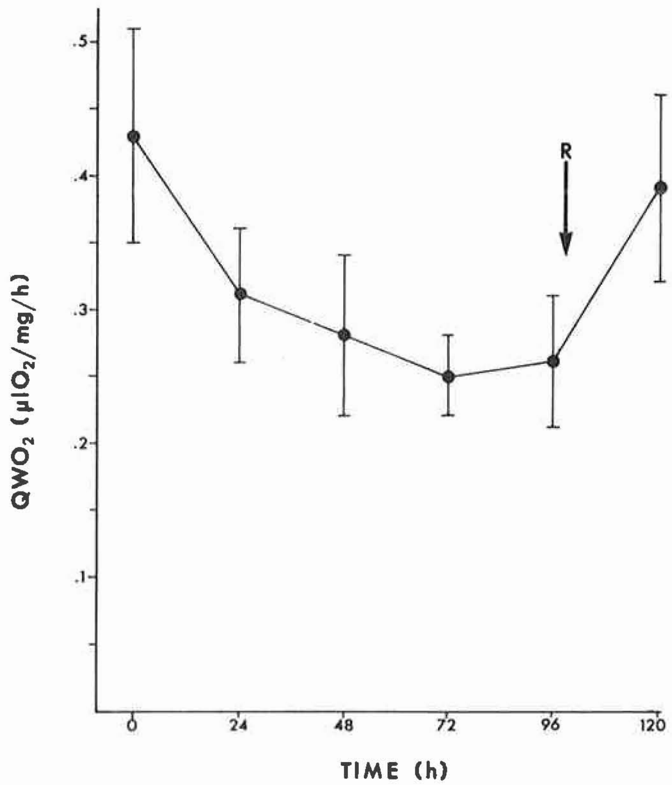

Figure 15. Effect of short-term starvation and refeeding on the respiration rate of O. affinis. Animals starved between 0 and 96 hours; time of refeeding indicated by R. Based on data in Table 24.

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