Mass-Length relationships of Namib Tenebrionids

J.R. HENSCHEL AND M.K. SEELY

Desert Ecological Research Unit,
P.O. Box 953, Walvis Bay, Namibia

Received March 1995; accepted November 1995

Understanding ecological relationships, ecosystem dynamics and energetics and energy flow often require biomass data on a large scale. In a desert environment, large-scale collection of individuals from the sparse biota is not desirable. On the other hand, capture and release of organisms, particularly the common tenebrionid beetles, is feasible. This note presents a general mass-vs-length equation for deriving biomass from length measurements of Namib Desert tenebrionid beetles.

We derived such a relationship from forty species found in the dunes, gravel plains and riverbed near Gobabeb, Namibia (23°32'E, 15°02'S) during a long-term population study of tenebrionids (Table 1). We used voucher specimens (n = 280) that have been kept air-dried for at least 10 years in the collection of the Desert Ecological Research Unit at Gobabeb. Total head-and-body length was measured with callipers (± 0.1mm). Air-dried individuals were weighed (electronic balance ± 0.1mg). One

TABLE 1: Tenebrionid species measured for the present study. Mean dry mass and length of each are indicated.

TRIBE	SPECIES	LENGTH (mm)	MASS (mg)
Adesmiini	Cauricara eburnea (Pascoe)	9.7	44
Adesmiini	Epiphysa arenicola Penrith	18.0	384
Adesmiini	Eustolopus octoseriatus Gebien	13.1	105
Adesmiini	Metriopus depressus (Haag)	11.1	54
Adesmiini	Onymacris plana (Péringuey)	18.7	328
Adesmiini	Onymacris rugatipennis r. (Haag)	17.7	235
Adesmiini	Onymacris unguicularis (Haag)	17.4	252
Adesmiini	Physadesmia globosa (Haag)	15.4	236
Adesmiini	Physosterna cribripes (Haag)	18.4	402
Adesmiini	Stenocara gracilipes Solier	12.5	110
Adesmiini	Stenocara (Cauricara) phalangium (Gebien)	9.8	34
Adesmiini	Stenocara (Cauricara) velox (Péringuey)	9.4	35
Cryptochilini	Pachynotelus albonotatus Haag	13.2	71
Cryptochilini	Pachynotelus lineatus Haag	8.0	13
Eurychorini	Eurychora sp.	14.5	70
Eurychorini	Lepidochora discoidalis (Gebien)	10.7	35
Eurychorini	Lepidorchora kahani Koch	15.3	68
Eurychorini	Lepidochora porti Koch	12.1	47
Eurychorini	Stips dohrni (Haag)	11.6	47
Eurychorini	Stips stali (Haag)	11.9	56
Molurini	Namibomodes muculicollis Koch	12.1	37
Molurini	Namibomodes serrimargo (Gebien)	12.7	33
Molurini	Namibomodes zarcoi Koch	10.6	21
Molurini	Psammodes sp.	27.7	501
Opatrini	Gonocephalum sp.	11.7	37
Opatrini	Parastizopus armaticeps (Péringuey)	16.7	160
Opatrini	Psammogaster malani Koch	5.1	6
Platynotini	Gonopus tibialis Fabricius	18.9	321
Scaurini	Carchares macer Pascoe	11.9	34
Tentyriini	Rhammatodes subcostatus Koch	7.3	7
Zophosini	Zophosis (Calosis) amabilis Deyrolle	11.0	36
Zophosini	Zophosis (Occidentophosis) cerea Penrith	10.8	27
Zophosini	Zophosis (Occidentophosis) damarina Pér.	11.6	32
Zophosini	Zophosis (Gyrosis) devexa Péringuey	7.3	12
Zophosini	Zophosis dorsata Péringuey	13.6	56
Zophosini	Zophosis (Cardiosis) fairmairei Péringue	5.5	3
Zophosini	Zophosis (Cardiosis) hamiltonuli Koch	4.2	2
Zophosini	Zophosis (Cerosis) hereroensis Gebien	8.9	16
Zophosini	Zophosis (Gyrosis) moralesi (Koch)	9.6	33
Zophosini	Zophosis (Gyrosis) orbicularis Deyrolle	11.2	62

beetle of each species was oven-dried at 65°C and re-weighed to determine its mass loss due to moisture. The difference between air-dried and oven-dried specimens ($2.9 \pm 2.0\%$) was used to calibrate all mass data to the oven-dried standard. We calculated linear regressions on logarithmically transformed data and applied a modified t-test to compare slopes of regression equations, following Zar (1984).

The general mass-vs-length equation for Namib tenebrionids is: Mass = 0.0186 x Length $^{3.201}$ ($r^2 = 0.89$; n = 280).

The regression equations derived for each species were not significantly different between tribes (t-test; $P>0.1$).

Namib tenebrionids were heavier than expected from Rogers *et al.*'s (1976) general curve (mass = 0.0305 x length $^{2.62}$) by $3.0 \pm$ SD 1.4 times (range: 1.0 – 7.8 times). This may be because Namib beetles are more heavily chitinized than the average insect in North America.

Our mass-vs-length relationship can be used to improve previous estimates. To illustrate this, we applied the equation to Henschel's (1994) data on the diet and consumption rates of the spider *Leucorchestris arenicola*. We found that these spiders consume 7 times their own mass per annum. An average-sized 1.7g spider thus consumes 33mg prey.spider^{-1}.day^{-1}, or 1.9% of its body weight per day. This is two-thirds of the consumption rate of an equivalent-sized Australian lycosid (Humphreys 1975), instead of one-quarter, as Henschel (1994) had estimated.

The Ministry of Environment and Tourism gave permission for this work to be carried out in the Namib-Naukluft Park. Inge Henschel and Petra Jobst assisted with measuring beetles. JRH was the recipient of an Alexander-von Humboldt Scholarship.

REFERENCES

HENSCHEL, J.R. 1994. Diet and foraging behaviour of huntsman spiders in the Namib dunes (Araneae: Heteropodidae). *J. zool., Lond.* 234: 239-251).

HUMPHREYS, W.F. 1975. The food consumption of a wolf spider, *Geolycosa godeffroyi*, (Araneae: Lycosidae), in the Australian Capital Territory. *Oecologia* 18: 343-358.

ROGERS, L.E., HINDS, W.T. & BUSCHBOM, R.L. 1976. A general weight vs. length relationship for insects. *Annals of the entomological society of America* 69: 387-389.

ZAR, J.H. 1984. Biostatistical analysis. Prentice-Hall, London.