tissues. It yields a finer precipitate than previous lead-based methods and does not interfere with the EDTA-decalcification treatment. *P.C. is Senior Research Assistant of the National Fund for Scientific Research (F.N.R.S., Belgium). Supported by the Fund for Joint Basic Research (convention n°2.4527.89).*

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15 RELATIVE MASSES OF THE SKELETAL ELEMENTS IN BIRDS. *J. Cubo, M. Majoral, C. Viladiu* and *A. Casinos.* University of Barcelona, Spain.

The dry mass from different skeletal elements of 44 sepecimens, belonging to 39 species of birds, was measured. The body mass range was 5.7-1430g. Correlations of the mass of the skeletal elements to body mass were established by means of Model II of regression. Positive allometry was found in the case of the femur, clavicle, sternum and caudal vertebrate. For every long bone the slope calculated was not significantly different from that corresponding to the same bone in insectivores and rodents (1) but statistically significant differences were found in the case of humerus, ulna-radius and tibia-tarsus when y-interceptions were compared. Birds always showed higher y-interceptions. Some species display special values for some of their skeletal elements. For example, Phasianidae have lighter fore-limb bone masses than exptected. In contrast, some Ardeidae show especially heavy hind limb bones. This kind of situation is discussed in relation to their particular adaptative meaning, such as the short sustained flight of most of the Phasianidae or the particular aquatic habitat of the Ardeidae. The possibility that some of the long bones were heavier in birds than in insectivores and rodents, is examined.

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16 SWIMMING KINEMATICS IN THE AXOLOTL (*AMBYSTOMA MEXICANUM*): DO THEY REFLECT THE SAME MECHANISM AS IN FISHES ? *K. D'Août, P. Aerts* and *F. De Vree* - University of Antwerp (UIA).

The kinematics of straight forward swimming at a constant speed was studied in the neotenic salamander *Ambystoma mexicanum* by means of high-speed video. *Ambystoma mexicanum* has an undulatory, anguilliform (eel-like) swimming mode. Important parameters of the propulsive wave (wavelength, frequency, speed and amplitude), and two measures for the mechanical swimming efficiency were calculated: the propeller efficiency (dimensionless) and the specific stride length (body

lengths per swimming cycle). Swimming speed was found to be frequency-regulated, while the wavelength of the propulsive wave appeared to be constant. Hence, the speed of the propulsive wave increases with increasing swimming speed. The amplitude of the propulsive wave is minimal just posteriorly to the head and increases considerably to reach a maximum at the tail tip. The mechanical efficiency was found to increase in a hyperbolical manner with increasing swimming speed. Both the propeller efficiency and the specific stride length are thus maximal at high swimming speeds (more than 2.5 body lengths per second), with values of about 0.67 and 0.38 respectively. These characteristics are also typical for anguilliform swimmers among fishes. For the eel (*Anguilla anguilla*), comparable propulsion wave characteristics have since long been described (1). A propeller efficiency of 0.65 (2) and a stride length of 0.49-0.55 body lengths per second (1, 3) were calculated. Despite the striking analogy in swimming kinematics for the axolotl and the eel, the considerable difference in stride length might reflect a different underlying swimming mechanism. This can be due to a different muscle activation pattern, but to morphological differences as well. For instance, the more homogeneous cross-sectional shape and mass distribution over the eel body when compared to the axolotl, might be related to the observed difference in stride length and reflect a different swimming mechanism. *Supported by I.W.O.N.L. grant 920137 (K.D.) and F.K.F.O. grant 2.9005.90 (F.D.V.).*

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17 THE ACTUAL FOOD OF MACROCONSUMERS GRAZING ON LEAVES OR INGESTING DETRITUS OF *POSIDONIA OCEANICA* SEAGRASSES : A δ^{13} C STUDY.

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The grazers *Paracentrotus lividus* (Echinoid), *Idotea baltica* (Isopod) and *Sarpa salpa* (Teleost), and the detritivorous *Holothuria tubulosa* are among the only macroconsumers observed feeding on *Posidonia* seagrasses material in the Mediterranean. A question however remains : do these animals actually assimilate the organic matter of this tough plant or do they preferentially feed on its epiphytes ? The analysis of stable carbon isotope ratios in animal tissues allows to elucidate the origin of organic carbon because δ^{13} C of the two plant groups are well distinct (between -14 and -11‰) clearly showing that this isopod assimilates seagrass carbon (this is confirmed by laboratory feeding