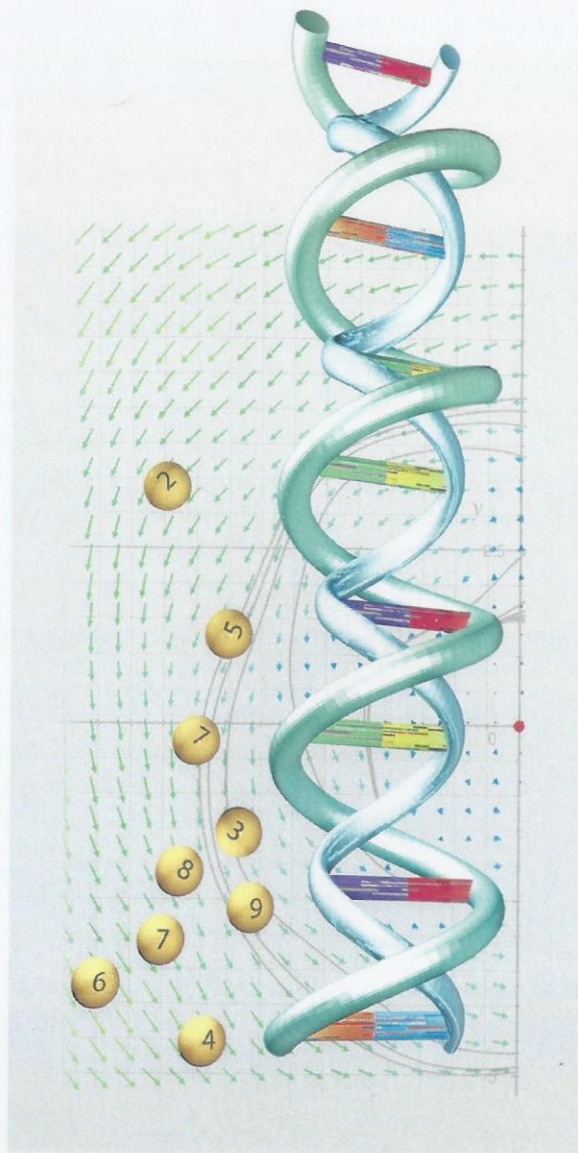


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**Model building and parameter estimation: describing the influence of storage temperature and time on the respiration rate of diced onions**

by

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For fresh-cut fruits and vegetables, respiration plays a major role in their post-harvest life. While maintaining the quality and assuring the safety of fresh produce, temperature is the key element, as low temperatures decrease respiration rates, enzymatic and microbial activity. Therefore, a good knowledge of the effect of temperature on respiration is required. Furthermore, time plays an important role, as different produce have shown increase, decrease or maintenance of respiration rate with time, at a constant temperature. The aim of this study was to investigate the effects of storage temperature and time on the respiration rate of diced red onions under ambient atmosphere, and to develop a predictive mathematical model accounting for the effect of both, time and temperature. Non-linear regression analysis was applied, using least squares estimation with a Levenberg-Marquardt numerical algorithm. A simple first-order exponential model proved to describe adequately the time effect, while the temperature effect on the estimates has shown an Arrhenius-type dependency. Reparameterization of the Arrhenius model was performed by centring the model around the reciprocal of a reference temperature in order to reduce correlation between model parameters. A global model was built and new estimates were obtained through a one-step non-linear regression procedure, thus improving their precision. Least-squares assumptions were checked and model fit was assessed. Asymptotic joint confidence regions were also obtained.

Keywords: Non-linear regression, confidence regions, reparameterization.

**Patterns of variation in concentrations of metals and metalloids in *Oc-topus vulgaris* tissues**

by

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We analyzed patterns of variation in levels of 17 metals and metalloids (arsenic,

calcium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, potassium, rubidium, selenium, strontium, titanium, vanadium, zinc and) in several tissues (digestive gland, branchial hearts, gills, mantle and arms) of common octopus (*Octopus vulgaris*) at three locations along the Portuguese coast, during the two seasons of the year (autumn and spring). Particle Induced X-ray Emission (PIXE) was used to measure element concentrations. We used redundancy analysis to relate element concentrations to biological variables (sex, weight, total and mantle length, maturity, digestive gland index), location and season. Seasonal and/or geographical variations in the pattern of element concentrations were apparent for all of the tissues sampled, except for branchial hearts. Body size and condition also affected element concentrations, as did maturity state in the case of branchial heart samples. There were no differences between sexes. Gills seems to be the most useful tissue to sample because showed regional and seasonal variation in concentration of elements and a marginal effect of body size was detected. Results suggest that octopus can be a useful bioindicator of environmental pollution.

Keywords: Bioaccumulation, pollution, bioindicator, redundancy analysis

#### References

- Barreiros, M., Pinheiro, T., Arajo, M., Costa, M., Palha, M., Silva, R. (2001). Quality assurance of X-ray spectrometry for chemical analysis. *Spectrochim. Acta Part B* 56, 2095-2106.
- Boyle, P., Rodhouse, P. (2005). *Cephalopods Ecology and fisheries*. Blackwell Publishing Company.
- Bustamante, P. (1998). Bioaccumulation des lments traces (mtaux et terres rares) chez les mollusques cphalopodes et bivalves pectinids. Implication de leur biodisponibilit pour le transfert vers les prdateurs. PhD thesis. Universit de La Rochelle, France.
- Bustamante, P., Cherel, Y., Caurant, F., Miramand, P. (1998). Cadmium, copper and zinc in octopuses from Kerguelen Islands, Southern Indian Ocean. *Polar Biol.* 19, 264-271.
- Bustamante, P., Cosson, R., Gallien, I., Caurant, F., Miramand P. (2002a). Cadmium detoxification processes in the digestive gland of cephalopods in relation to accumulated cadmium concentrations. *Mar. Envir. Res.* 53, 227-241.
- Bustamante, P., Grigioni, S., Boucher-Rodoni, R., Caurant, F., Miramand, P. (2000). Bioaccumulation of 12 trace elements in the tissues of the nautilus *Nautilus macromphalus* from New Caledonia. *Mar. Pol. Bull.* 40, 688-696.
- Falandysz, J. (1992). Macroelements content of common pacific squid (*Loligo opalescens*). *Z. Lebensm. Unters. For.* 187, 359-361.
- Gerpe, M., Moreno, J., Moreno, V., Patat, M. (2000). Cadmium, zinc and copper accumulation in the squid *Illex argentinus* from the Southwest Atlantic Ocean. *Mar. Biol.* 136, 1039-1044.
- Guerra, A. (1975). Determinacin de las diferentes fases del desarrollo sexual de *Octopus vulgaris* Lamarck, mediante un ndice de madurez. *Invest. Pesquera* 39, 397-416.
- Mangold, K., Bidder, A. (1989). Lppareil digestif et la digestion. In Mangold, K. (Ed.) Grass, P.P. (Series Ed.) *Cphalopodes*. Tome V. *Trait de Zoologie Anatomie, Systmatique, Biologie*. Masson, Paris, pp. 321-373.

- Miramand, P., Bentley, D. (1992). Concentration and distribution of heavy metals in tissues of two cephalopods, *Eledone cirrhosa* and *Sepia officinalis*, from the French coast of the English Channel. *Mar. Biol.* 114, 407-414.
- Miramand, P., Guary, J. (1980). High concentrations of some heavy metals in tissues of the Mediterranean *Octopus*. *Bull. Environ. Contam. Toxicol.* 24, 783-788.
- Raimundo, J., Caetano, M., Vale, C. (2004). Geographical variation and partition of metals in tissues of *Octopus vulgaris* along the Portuguese coast. *Sci. Total Environ.* 325, 71-81.
- Reis, M., Alves, L. (1992). DATTPIXE, A Computer Package for TTPIXE Data Analysis. *Nucl. Instrum. Methods B.* 68, 300-304.
- Seixas, S., Pinheiro, T., Sousa Reis, C. (2002). Lead in octopus (*Octopus vulgaris*) in Portugal: A preliminary study. *B. Mar. Sci.* 72, 1091-1093.
- Seixas, S., Bustamante, P., Pierce, G.J. (2005). Accumulation of mercury in the tissues of the common octopus *Octopus vulgaris* (L.) in two localities on the Portuguese coast. *Sci. Total Environ.* 340, 113-122.
- Seixas, S., Bustamante, P., Pierce, G. J. (2005b). Interannual patterns of variation in concentrations of trace elements in arms of *Octopus vulgaris*. *Chemosphere* 59, 1113-1124.
- Seixas, S., Pierce, G.J. (2005a). Bioaccumulation of lead, calcium and strontium and their relationship in the *Octopus vulgaris*. *Water, Air, Soil Pollut.* 163, 137-152.
- Seixas, S., Pierce, G.J. (2005b). Vanadium, rubidium and potassium in *Octopus vulgaris* (Mollusca: Cephalopoda). *Sci. Mar.* 62, 215-222. Silva L., Sobrino I., Ramos F. (2002). Reproductive biology of the common octopus, *Octopus vulgaris* Cuvier, 1797 (Cephalopoda: Octopodidae) in the Gulf of Cdiz (SW Spain). *Bull. Mar. Sci.* 71, 837-850.
- Storelli, M., Marcotrigiano, G. (1999). Cadmium and total mercury in some cephalopods from the south Adriatic Sea (Italy). *Food Addit. Contam.* 16, 261-265.
- Ueda, T., Ankara, M., Ishii, T., Suzuki, Y., Susuki, H. (1979). Amounts of trace elements in marine cephalopods. *J. Radiat. Res.* 20, 338-342.
- Van Espen, P., Janssens, K., Swentens I. (1986). AXIL X-ray Analysis Software-Users Manual, Camberra Packard, Benelux.
- Zuur, A., Leno, E., Smith, G. (2007). *Analysing Ecological Data*. Springer-Verlag.