
Ron O’Dor, Senior Scientist
Senior Scientist meets senior squid
Caught by Julie Stewart
Biologie des Céphalopodes benthiques et nectoniques de la Mer Catalane

Supplément n° 13 à "Vie et Milieu"

LABORATOIRE ARAGO
BANYULS-SUR-MER
1963

HERMANN
115, BOULEVARD SAINT-GERMAIN, PARIS VIe

1963
The role of cephalopods in the world's oceans
A Theme edited by M. R. Clarke

Volume 351  Pages 977–1112  Number 1343  29 August 1996
Squid recruitment dynamics

The genus *Illex* as a model, the commercial *Illex* species and influences on variability

Edited by P.G. Rodhouse, E.G. Dawe & R.K. O'Dor
Truncation of Externally Shelled Cephalopods
Squid anatomy is very plastic
MAR-ECO’s Sloan squid, *Promachoteuthis sloani*

Fig. 2. *Promachoteuthis sloani*. Paratype, drawings of preserved squid: A, dorsal view; B, ventral view. Drawings by Keiko Hiratsuka Moore, National Marine Fisheries Service.
Wild Architeuthis Pictures & DNA
Kubodera & Mori

A “little” B.C.
Moroteuthis robusta
Teuthwenia megalops, Vecchione, 2001
Cephalopods of the US continental slope
Mesonychoteuthis hamiltoni

"More dangerous than the giant squid, the colossal squid finds food by literally glowing in the dark."

- CNN, 3 April 2003
300kg Tuna April 12-13 2000

Block et al. TAG Project, unpublished
Total world cephalopod catch

Year

Thousand metric tonnes

G. Jackson et al. unpublished
Madeira Size Distributions

- **Cephalopods**
- **Fish**

Fig. 7.4 Estimated optimum temperatures for growth for squid. Based on the equations in Fig. 7.3. Full lines are growth potentials for animals of various weights (in g) at indicated temperatures. Dashed lines marks growth optima. The Y-intercept indicates the theoretical maximum temperatures for growth.

O'Dor & Wells, Life Cycles II, 1985

Cannibalism

Large Fish
Tunas, Billfish, Broadbills, etc.

Birds

Marine Mammals

MUSCULAR SQUIDS
Ommastrephids
Loliginids
Paralarvae, juveniles

Small fishes of all sizes up to the length of the cephalopod predator (myctophids, etc.)

Midwater crustaceans and other small organisms
Beaks in predator stomachs record species & biomass

Clarke, 1986 (3-D pairs)
Statolith Daily Rings

Illex illecebrosus  Illex argentinus

Arkhipkin & Perez, FAO, 1998
Figure 8.8. Ommastrephid gladius (A) dorsal view and position in relation to the squid mantle; a = represents one cm interval; shadowed area corresponds to the portion of the gladius where growth marks are not distinguished; (B) ostracum growth marks observed on the dorsal surface of the gladius of *Illex argentinus* (courtesy of V. Bizikov); (C) deposition of layers on the anterior border (head) of the gladius of *Illex illecebrosus*.
Fig. 2: Mean size-specific instantaneous growth rate $G$ variation (filled triangles) and percentage waste of growth potential $DGP$ at different temperatures. Temperatures in °C are indicated next to each line.

Fig. 1: Study area and positions where juvenile *Illex illecebrosus* were sampled. The physical environment around the fishing stations can be described partially by daily positions of the northern boundary of the Gulf Stream, the shelf/slope front and the Gulf Stream eddy activity derived from NOAA satellite thermal imagery (Drinkwater *et al.* 1994). Numbers represent the sample and (last two digits) year of sampling. Latitudes and longitudes are decimal-transformed.
Figure 8.11. Processes of size-differentiation of a squid school (A) Growth depensation, which results from variability of growth rates within the school, is depicted by a positively skewed size distribution ($g > 0$). B. Cannibalism that results in the elimination of smaller individuals is depicted by negatively skewed size distributions ($g < 0$). The arrows indicate the tendency of the size-differentiation process. $g =$ coefficient of skewness.
Fig. 7.3 A comparison of actual and potential growth of a theoretical *Illex illecebrosus*. Daily *ad libitum* feeding rates in (c) are calculated from the equation, $FR = 0.058W^{0.79}1.082^T$, and metabolic rates from, $MR = 0.0043W^{0.96}1.187^T$ using the natural combinations of size and temperature in (d) and (e). Both equations are based on regressions of the data in Table 7.6. Panel b shows the potential growth (FR−GR). Panel a compares actual growth to potential growth as a percentage.

Mobility

Speed (m s\(^{-1}\)) vs. Mass (kg)

- Scombrids
- Loligo
- Ommastrephes
- Wahoo
- Ammonium
- Cuttlebone
- Swimbladder
- Basking Shark

Trout
Ceph vs. Fish

Metabolic Costs of Speed

Webber et al. 2000
COML MAR-ECO project, Charlie-Gibbs fracture zone, unpublished
O'Dor, Malacologia 1988
Loligo opalescens, 40g
Bamfield Marine Station
British Columbia, 1980
Illex illecebrosus, 400g
Aquatron Pool, Dalhousie
Nova Scotia, 1982
Loligo forbesi, 4kg
Azores, 1989
Loligo forbesi
(Tuna chow)

Azores
Resting at 440m

Climbing at 0.12ms⁻¹

'Soaring' at 400m
"Illex climb & glide"

"Loligo soar"
I have meetings scheduled in Halifax on 12 and 15 March and was no

O'Dor, Integ. Comp. Biol. 2002
Loligo opalescens tagging
John Payne, Puget Sound
Pacific Ocean Shelf Tracking (POST)

115 VR-1/2 receivers in Puget Sound!

Acoustic Receivers

- NWIFC
- WDFW
- NOAA
- Puyallup Tr/Corps
- UW/KCnty/Seattle/Corps
- Seattle/Corps
- NOAA/Seattle/Corps

‘Automated’ Squid Tagger

30 squid tagged 2005
Cephalopod Speed - Finning vs. Jetting

\[ y = 2.0069x + 0.1279 \]

\[ R^2 = 0.9772 \]

Theoretical Optimum Jet Speeds (m·s⁻¹)

- Nautilus (pure jet)
- Loligo opalescens
- Dosidicus
Dosidicus cheat?
Squid Spoiler?
Spoilers decrease drag by optimizing fineness ratio.
Looks like a minimum thickness 3D muscular hydrostat.
(A molluscan trick, not available to simple vertebrates.)
In life, they fold up perfectly smoothly