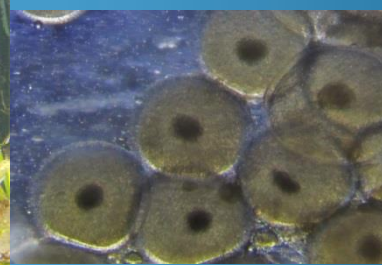




Contribution à la biologie et à l'écologie de la reproduction et de l'alimentation du picot rayé *Siganus lineatus* (Siganidés) dans le milieu naturel : perspectives pour la domestication des espèces « herbivores » en Nouvelle-Calédonie.



Problématique

Aqualagon : opérateur privé



Qualité aléatoire des élevages

Sources en eaux et en air appropriées

Ajustement des paramètres physico-chimiques et biologiques

Structures de culture

Compétences humaine

Brachionus sp. appropriés

Technique de culture fiable *Brachionus* sp.

Structures de culture

Compétences humaine

microalgues appropriées

Technique de culture fiable microalgues

Copépodes ?

1^{ère} alimentation larvaire

2^{nde} alimentation larvaire

Artemia sp.

3^{ème} alimentation larvaire

Sevrage

Pré-grossissement

Microparticules

Compétences

Gestion des géniteurs

Maturation des géniteurs

Pontes naturelles

Pontes induites

Eclosion

Axes de recherche

Structure génétique

Distance génétique des populations/introgression

↳ *Notion de stock et ressource génétique*

Croissance

Modèle de croissance

↳ *Facteurs de croissance et comparaison*

Alimentation

Besoin nutritionnel selon le cycle de vie

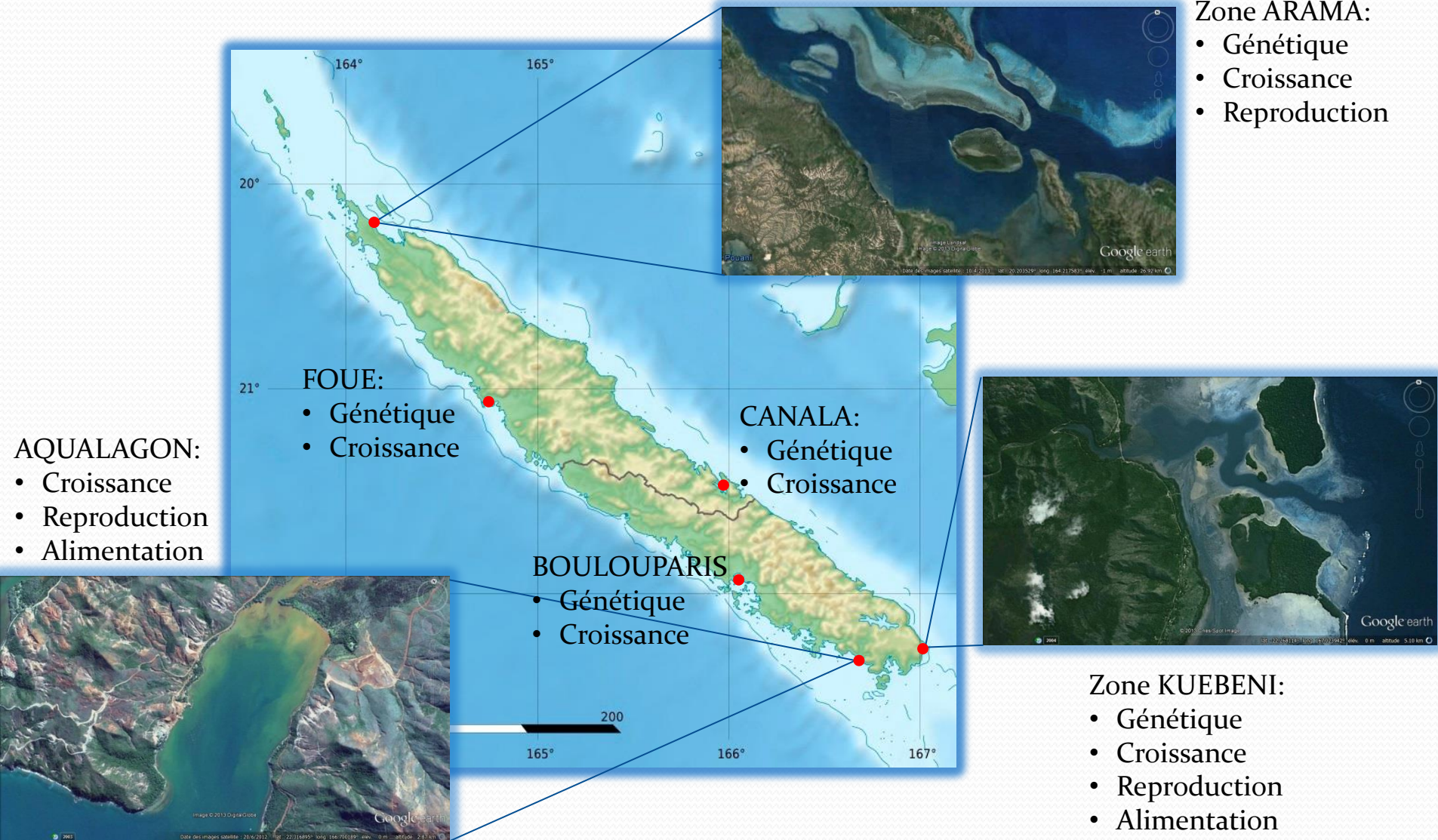
↳ *Alimentation et digestion (importance des lipides)*

Reproduction

Cycle de la reproduction

↳ *Facteurs et capacité de reproduction*

Sites de l'étude



Structure génétique

Zone d'étude:

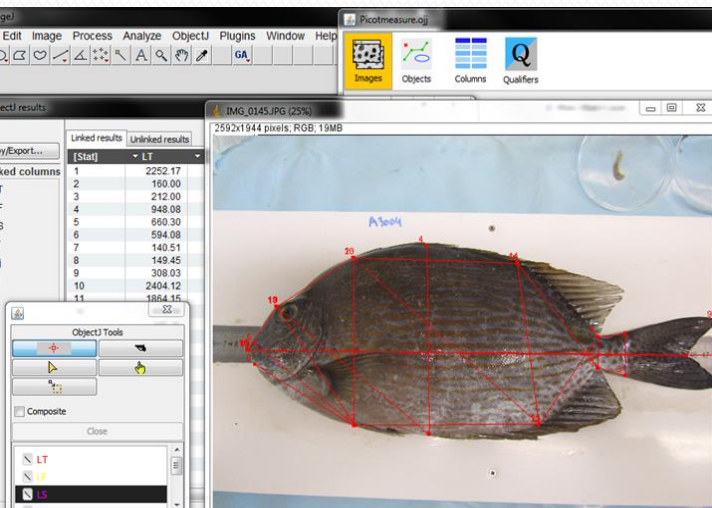
- Site: Arama vs Kuebeni vs Foué vs Boulouparis vs Canala (vs Vanuatu)

Caractérisation des individus

- Mesures morphologiques
- Pesée
- Prélèvement ADN *S. lineatus*, *S. randalli* et *S. vermiculatus*

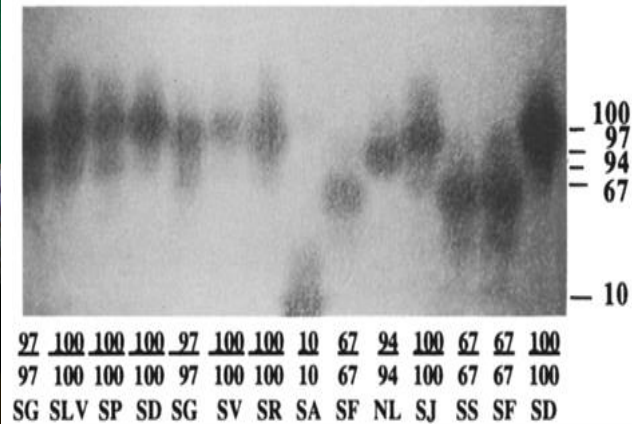
Prélèvement de *S. lineatus*, *S. vermiculatus* et *S. randalli*

Mesures



Analyses ADN

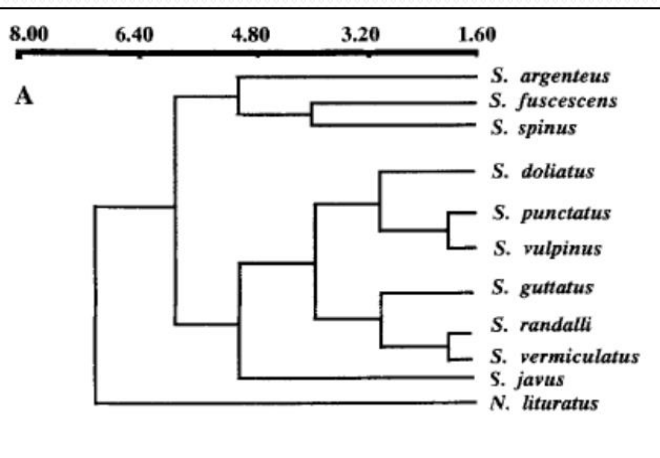
LDH-1*



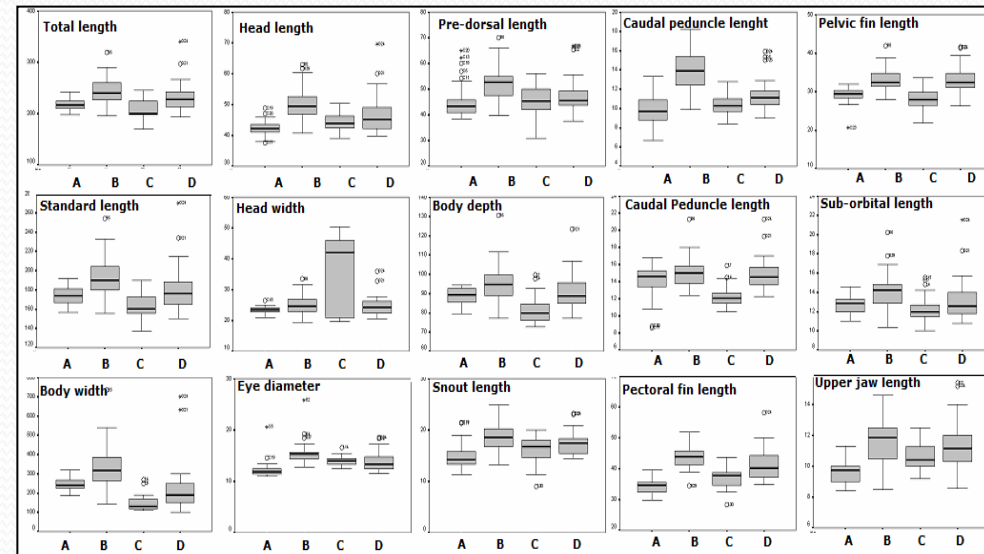
Relation taille-poids

Picot rayé en PNG :
 $Wt = 0.0569(FL)^{2.7103}$

Notion de distance génétique



Variabilités morphologiques/sites



Notion d'introggression/hybridisme

Genetic constitution of an unidentified specimen with *S. corallinus* group-2-like coloration

Cyt <i>b</i> type	<i>S. corallinus</i> group-2
ITS1 type	<i>S. corallinus</i> group-2 (13 clones) <i>S. puellus</i> (4 clones)
Estimated origin	<i>S. corallinus</i> group-2 (♀) × <i>S. puellus</i> (♂)

Croissance

Zone d'étude:

- Site: Arama vs Kuebeni vs Foué vs Boulouparis vs Canala (vs PNG)

Caractérisation des individus

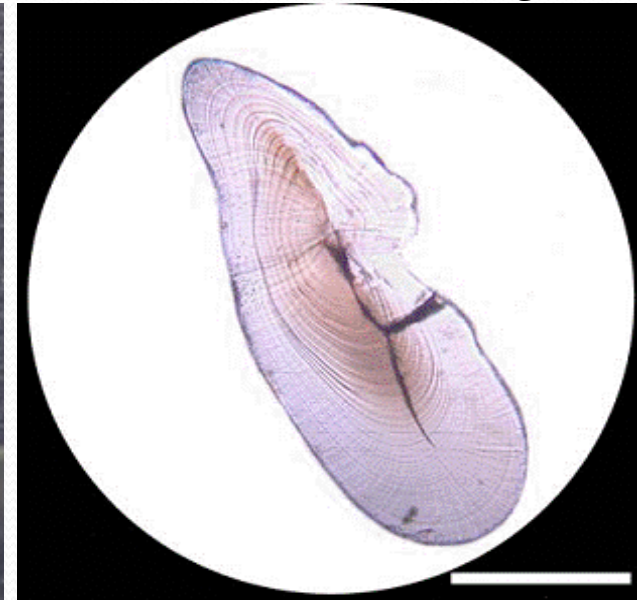
- Mesures morphologiques
- Pesée
- Prélèvements d'otolithes



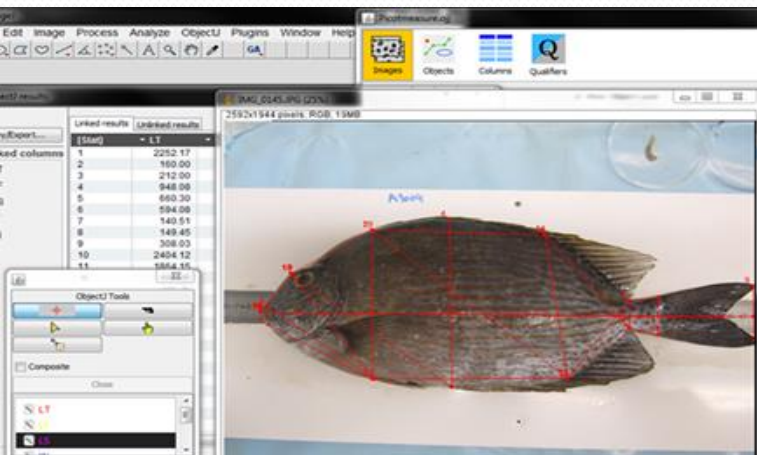
Prélèvement des otolithes



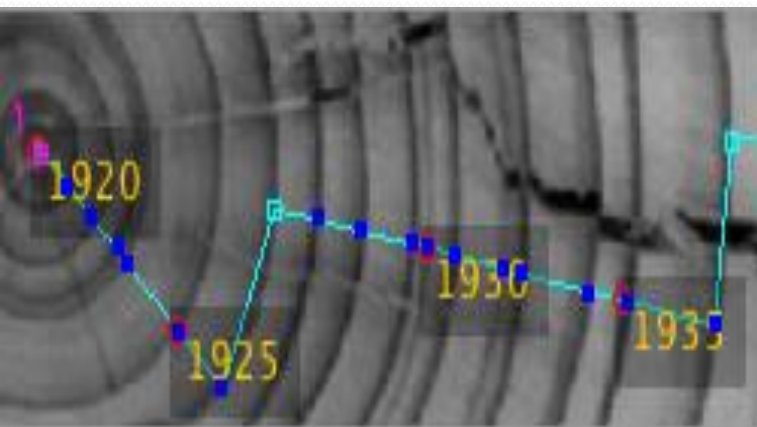
Détermination de l'âge



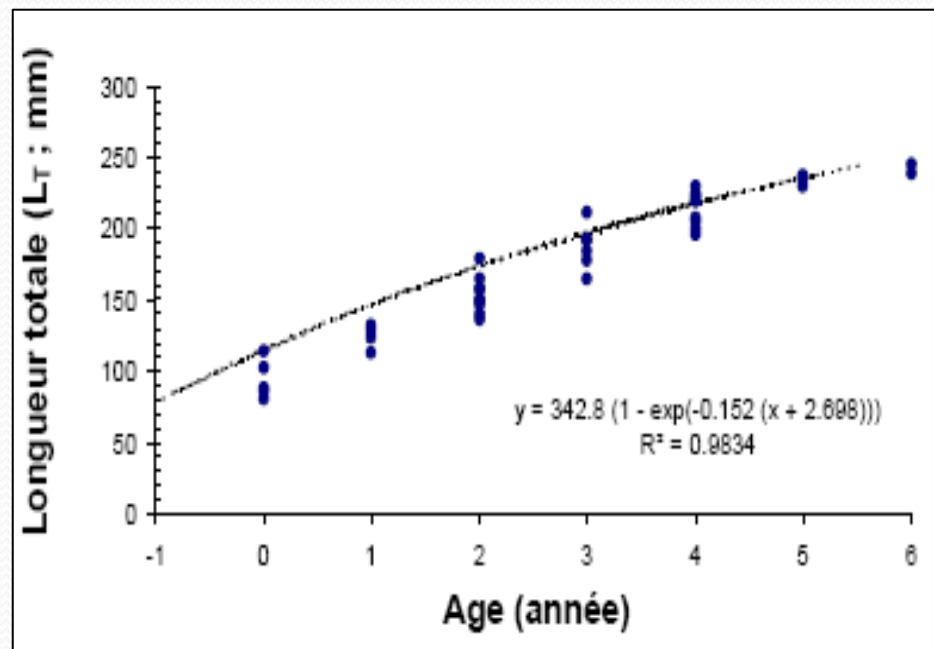
Mesure



Lecture des anneaux



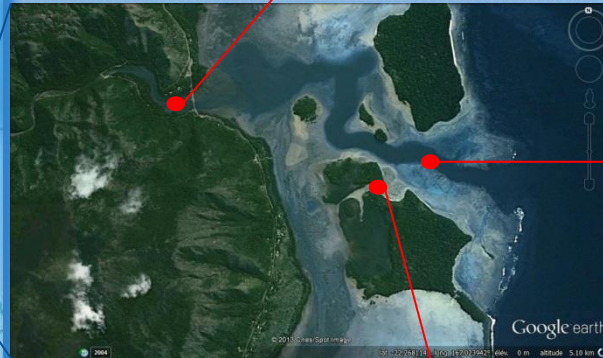
Modèle de croissance



Alimentation



Station estuaire



Station récifale



Station mangrove

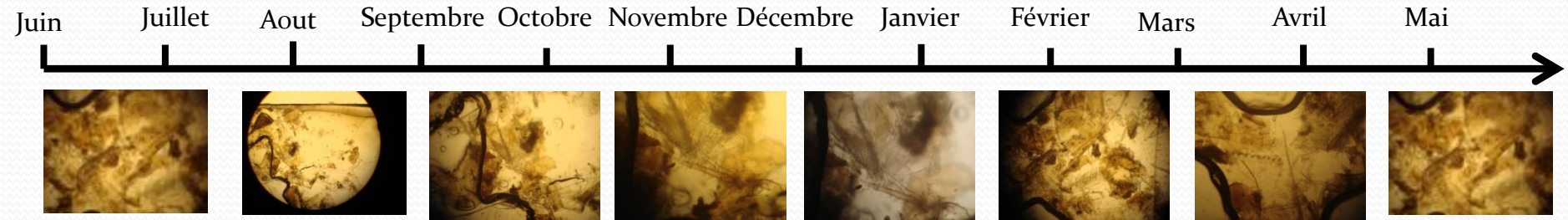
Durée : 12 mois

Périodicité : hebdomadaire

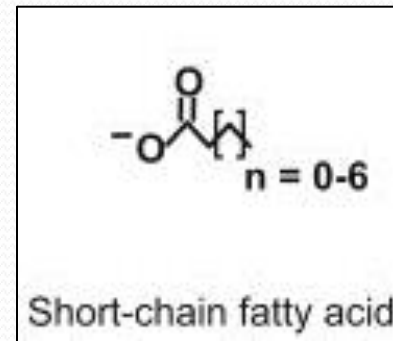
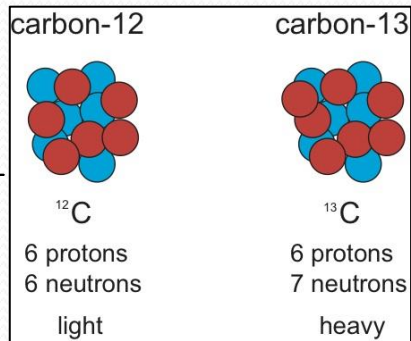
Zone KUEBENI:

- Mesures morphologiques
- Contenu intestinal
- Signature isotopique
- Small Chain Fatty Acids
- Teneur en acide gras
- Biomarqueur lipidique

Contenu intestinal



Signature isotopique



SCFA



Sources nutritionnelles et mécanisme digestif

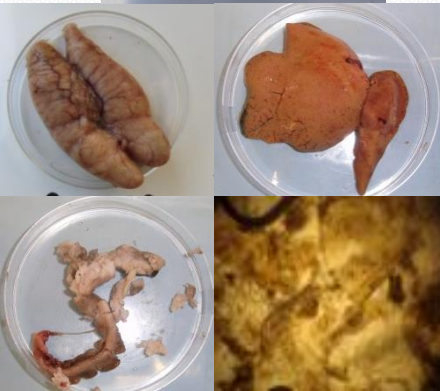


TABLE 5
The Fatty Acid Composition of the Lipids in the Respective Organs of *Siganus canaliculatus*^a

	Muscle				Liver			Other viscera ^b		
	TAG	FFA	PE	PC	TAG	FFA	PE	TAG	FFA	PE
Total saturated	43.7	32.5	28.5	28.0	47.6	33.8	34.4	46.0	37.3	35.6
14:0	5.9 ± 0.2	2.1 ± 0.2	1.6 ± 0.3	0.4 ± 0.0	3.3 ± 0.3	1.1 ± 0.1	1.2 ± 0.2	6.3 ± 0.1	3.3 ± 0.2	3.9 ± 0.2
15:0	1.1 ± 0.0	0.6 ± 0.0	0.4 ± 0.1	0.1 ± 0.0	0.9 ± 0.1	0.4 ± 0.0	0.6 ± 0.1	1.0 ± 0.0	0.7 ± 0.0	1.1 ± 0.1
16:0	30.1 ± 0.4	22.7 ± 0.9	14.8 ± 1.5	9.7 ± 0.4	33.7 ± 0.6	23.3 ± 1.5	14.7 ± 1.2	31.6 ± 0.4	22.6 ± 1.0	18.2 ± 0.7
17:0	1.1 ± 0.1	0.7 ± 0.0	0.7 ± 0.0	0.7 ± 0.0	0.9 ± 0.1	0.6 ± 0.0	0.9 ± 0.1	1.3 ± 0.1	1.0 ± 0.0	0.9 ± 0.1
18:0	5.1 ± 0.2	6.1 ± 0.1	10.7 ± 1.2	16.9 ± 0.8	8.4 ± 0.3	8.2 ± 1.0	16.7 ± 0.7	5.2 ± 0.2	9.4 ± 0.6	11.0 ± 0.3
20:0	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.3 ± 0.0	0.1 ± 0.0	0.2 ± 0.0
22:0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.0 ± 0.0	0.1 ± 0.0	0.0 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
24:0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0
Total monoenic	23.3	18.4	14.8	8.6	17.6	15.6	10.6	22.0	17.7	16.6
14:1	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.3 ± 0.0	0.8 ± 0.1
15:1	0.1 ± 0.0	0.1 ± 0.0	2.2 ± 0.6	1.1 ± 0.2	0.1 ± 0.0	0.7 ± 0.3	1.2 ± 0.3	0.1 ± 0.0	0.1 ± 0.0	2.1 ± 0.3
16:1n-9	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.3 ± 0.1	0.5 ± 0.1	0.2 ± 0.0	0.1 ± 0.0	0.2 ± 0.1	0.5 ± 0.1
16:1n-7	7.9 ± 0.2	4.1 ± 0.3	2.5 ± 0.4	0.7 ± 0.0	4.5 ± 0.3	3.0 ± 0.3	2.1 ± 0.3	6.4 ± 0.5	4.8 ± 0.2	3.7 ± 0.1
16:1n-5	0.5 ± 0.0	0.4 ± 0.0	0.4 ± 0.0	0.2 ± 0.0	0.3 ± 0.0	0.3 ± 0.1	0.3 ± 0.1	1.4 ± 0.3	0.6 ± 0.0	0.4 ± 0.0
17:1	0.5 ± 0.0	0.6 ± 0.1	0.4 ± 0.0	0.2 ± 0.0	0.4 ± 0.0	0.4 ± 0.0	0.3 ± 0.0	0.6 ± 0.0	0.5 ± 0.0	0.6 ± 0.0
18:1n-9	9.7 ± 0.2	8.8 ± 0.2	6.1 ± 0.5	4.2 ± 0.2	8.5 ± 0.3	7.6 ± 0.6	3.9 ± 0.1	9.0 ± 0.3	7.6 ± 0.2	6.1 ± 0.1
18:1n-7	3.4 ± 0.2	3.3 ± 0.2	2.3 ± 0.1	1.6 ± 0.1	2.6 ± 0.1	2.1 ± 0.1	1.9 ± 0.1	3.3 ± 0.1	2.9 ± 0.1	2.5 ± 0.1
18:1n-5	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.1 ± 0.0
20:1n-11	0.1 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0
20:1n-9	0.3 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.3 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.3 ± 0.0	0.2 ± 0.0	0.1 ± 0.0
20:1n-7	0.1 ± 0.0	0.1 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
22:1n-11	0.3 ± 0.0	0.4 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.3 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.3 ± 0.0	0.2 ± 0.0
22:1n-9	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
22:1n-7	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
24:1n-9	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.0 ± 0.0	0.2 ± 0.1	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
Total polyenoic	29.0	46.4	54.7	61.4	31.7	48.2	51.2	28.7	42.1	40.3
n-6 series	6.8	15.0	13.6	13.0	8.9	12.1	18.4	7.8	15.6	14.1
16:2n-6	0.6 ± 0.0	0.4 ± 0.0	0.4 ± 0.0	0.5 ± 0.0	0.4 ± 0.0	0.3 ± 0.0	1.5 ± 0.2	0.6 ± 0.0	0.4 ± 0.0	1.0 ± 0.1
18:2n-6	2.1 ± 0.1	2.3 ± 0.1	1.5 ± 0.1	0.9 ± 0.0	1.3 ± 0.1	1.0 ± 0.1	1.3 ± 0.1	2.2 ± 0.1	2.4 ± 0.1	2.3 ± 0.1
18:3n-6	0.7 ± 0.1	0.6 ± 0.1	0.5 ± 0.0	0.8 ± 0.0	0.3 ± 0.0	0.3 ± 0.0	0.6 ± 0.0	0.8 ± 0.1	0.6 ± 0.0	0.4 ± 0.0
20:3n-6	0.7 ± 0.0	1.1 ± 0.1	0.9 ± 0.0	0.5 ± 0.0	0.6 ± 0.0	0.6 ± 0.0	1.0 ± 0.1	0.7 ± 0.0	1.1 ± 0.1	1.1 ± 0.0
20:4n-6	2.7 ± 0.2	10.6 ± 0.8	10.3 ± 0.8	10.3 ± 0.6	6.3 ± 0.6	9.9 ± 0.2	14.0 ± 0.7	3.5 ± 0.3	11.1 ± 0.8	9.3 ± 0.6
n-3 series	22.2	31.4	41.1	48.4	22.8	36.1	32.8	20.9	26.5	26.2
16:3n-3	0.1 ± 0.0	0.1 ± 0.0	1.8 ± 0.5	1.5 ± 0.3	0.1 ± 0.0	0.8 ± 0.3	0.7 ± 0.2	0.2 ± 0.0	0.2 ± 0.0	0.7 ± 0.2
16:4n-3	0.1 ± 0.0	0.3 ± 0.1	0.3 ± 0.1	0.3 ± 0.0	0.1 ± 0.0	0.1 ± 0.0	0.7 ± 0.2	0.3 ± 0.1	0.1 ± 0.0	0.4 ± 0.1
18:3n-3	1.4 ± 0.2	1.1 ± 0.1	0.6 ± 0.1	0.2 ± 0.0	0.7 ± 0.1	1.2 ± 0.3	0.3 ± 0.0	1.3 ± 0.1	1.1 ± 0.1	0.7 ± 0.0
18:4n-3	1.1 ± 0.2	0.8 ± 0.1	0.3 ± 0.0	0.1 ± 0.0	0.5 ± 0.1	0.3 ± 0.0	0.1 ± 0.0	1.0 ± 0.1	0.8 ± 0.1	0.4 ± 0.0
20:3n-3	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.1 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.0	0.3 ± 0.0	0.3 ± 0.0
20:4n-3	1.4 ± 0.1	1.3 ± 0.2	0.8 ± 0.1	0.6 ± 0.0	0.6 ± 0.1	0.5 ± 0.0	0.6 ± 0.1	1.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.1
20:5n-3	1.2 ± 0.1	2.6 ± 0.2	1.8 ± 0.1	1.4 ± 0.1	0.8 ± 0.0	1.2 ± 0.1	1.1 ± 0.2	1.6 ± 0.0	2.3 ± 0.2	1.3 ± 0.1
22:4n-3	1.1 ± 0.1	2.6 ± 0.2	3.3 ± 0.3	4.6 ± 0.3	1.9 ± 0.2	3.1 ± 0.2	2.7 ± 0.3	1.0 ± 0.0	2.1 ± 0.1	2.9 ± 0.2
22:5n-3	4.6 ± 0.3	5.7 ± 0.3	5.4 ± 0.1	5.2 ± 0.1	2.4 ± 0.1	3.8 ± 0.3	3.2 ± 0.3	4.0 ± 0.2	4.1 ± 0.3	2.4 ± 0.1
22:6n-3	9.1 ± 0.4	14.7 ± 0.6	24.8 ± 1.5	32.5 ± 0.6	14.1 ± 1.1	22.5 ± 0.8	20.9 ± 0.9	8.5 ± 0.4	12.3 ± 0.9	13.5 ± 0.7
Unknown	1.8 ± 0.1	2.0 ± 0.1	1.8 ± 0.1	1.9 ± 0.1	1.4 ± 0.1	2.4 ± 0.2	2.3 ± 0.2	1.6 ± 0.1	2.1 ± 0.2	2.8 ± 0.1

^aResults are expressed as weight percentage of the total fatty acids. Data are mean ± standard error (n = 6-8).

^bThe levels of PC in the liver and other viscera of *S. canaliculatus* were very low, and its fatty acid composition could not be analyzed.



Nature des lipides



Bio marqueur lipidiques



Origine des lipides

Ingestion et utilisation des lipides

Reproduction

Durée : 12 mois
Périodicité : hebdomadaire

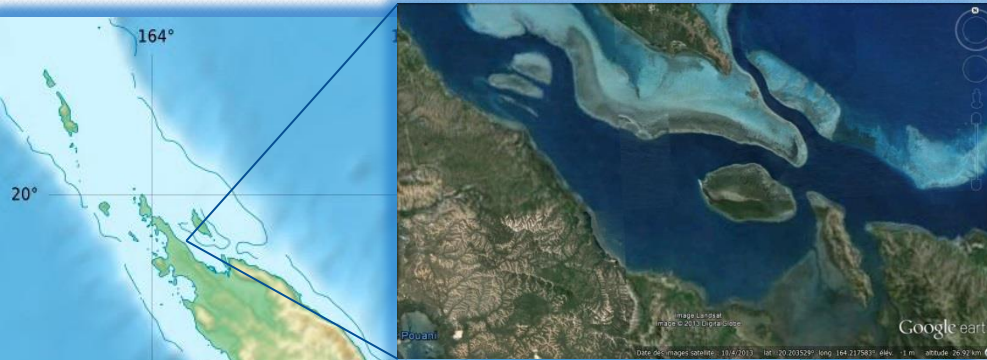
Zone ARAMA:

- Mesures morphologiques
- Sex-ratio
- Evolution des indices de condition (K, RHS, RGS)
- Organisation ovarienne
- Taux de fécondité
- Taille à la 1^{ère} maturité

VS

Zone KUEBENI:

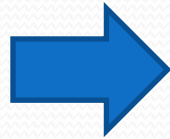
- Mesures morphologiques
- Sex-ratio
- Evolution des indices de condition (K, RHS, RGS)
- Organisation ovarienne
- Taux de fécondité
- Taille à la 1^{ère} maturité



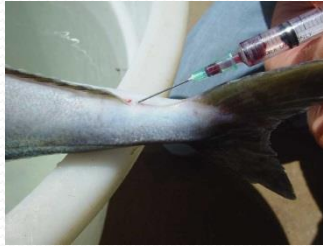
AQUALAGON

- Suivi des hormones sexuelles

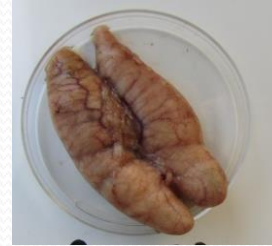
Prélèvements et mesures



Sang



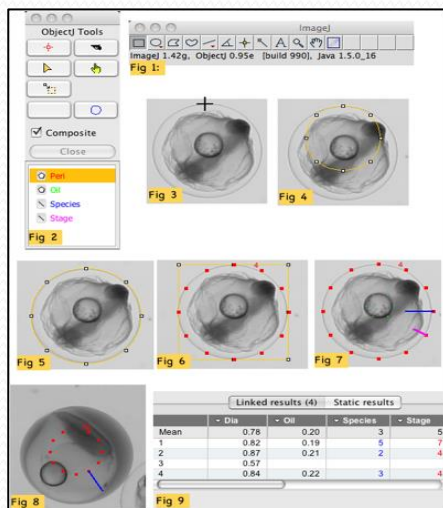
Gonades



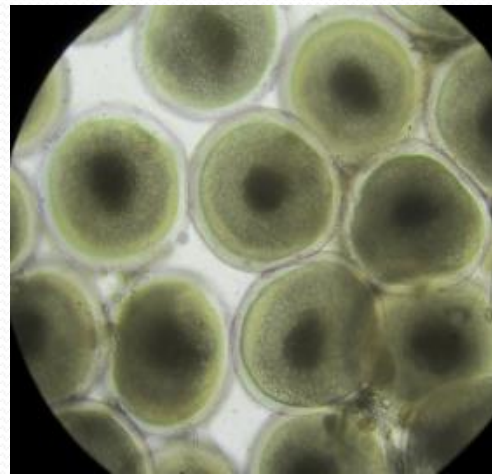
Foie



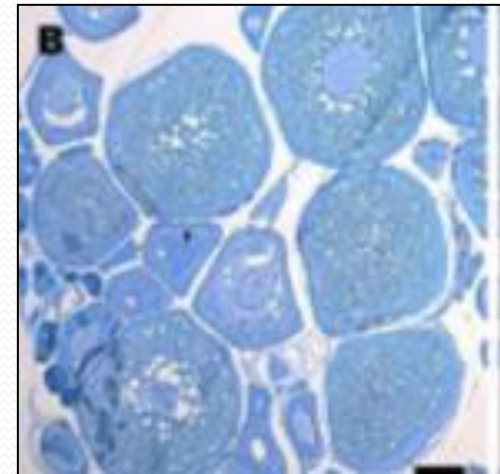
Comptage et mesure des ovocytes



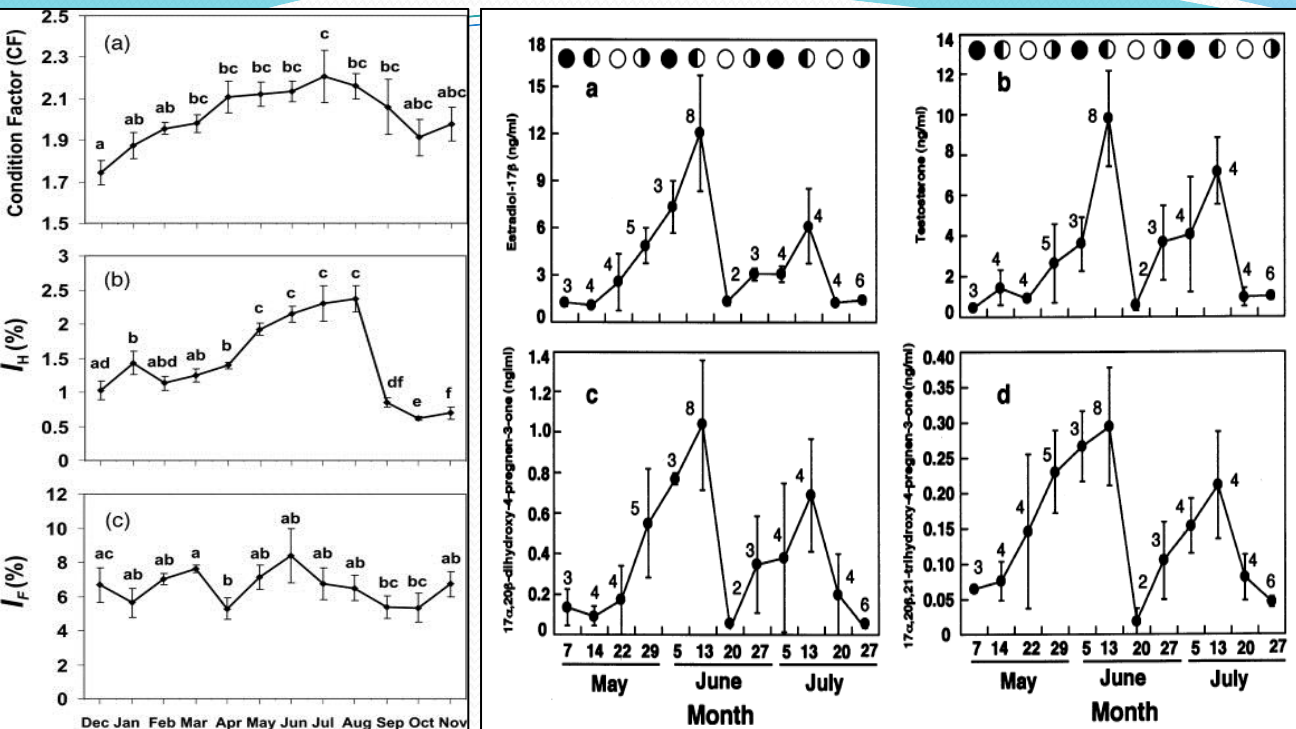
Etat de maturité



Histologie

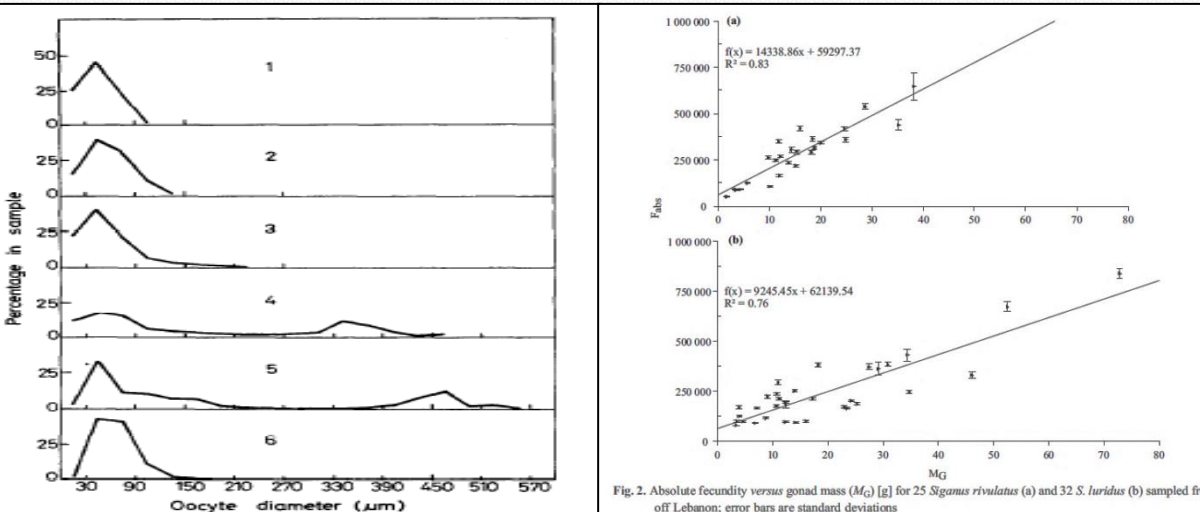


Suivi des rapports et des hormones sexuelles



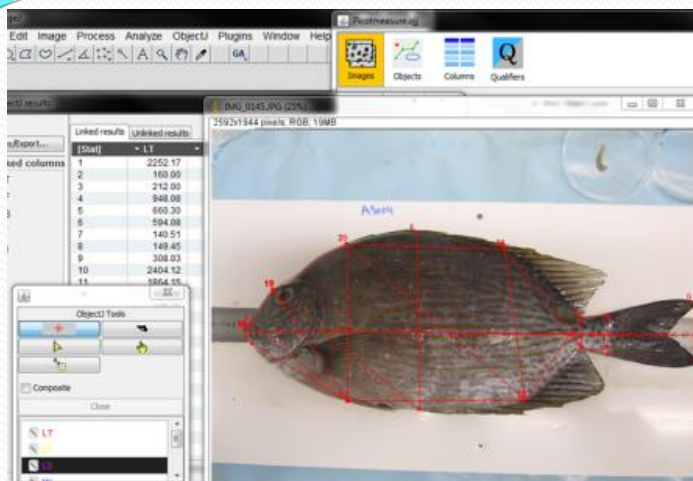
Période de reproduction et influence des facteurs

Organisation ovarienne et fécondité

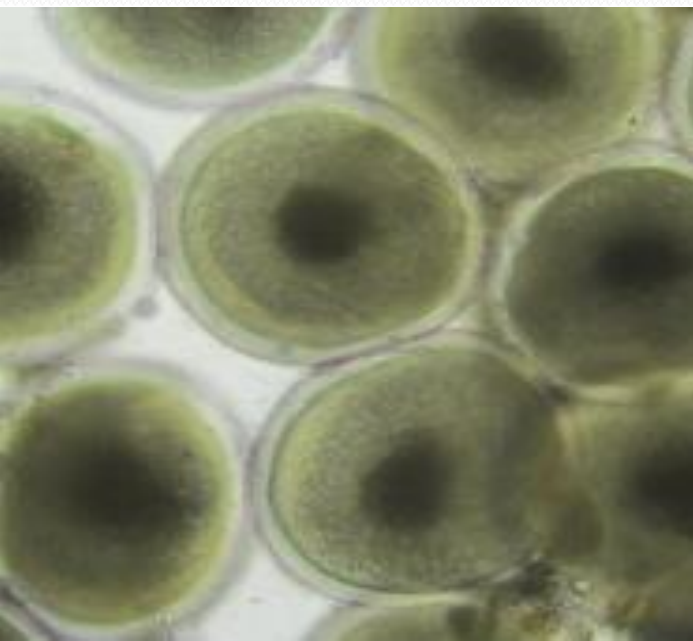


Capacité de reproduction

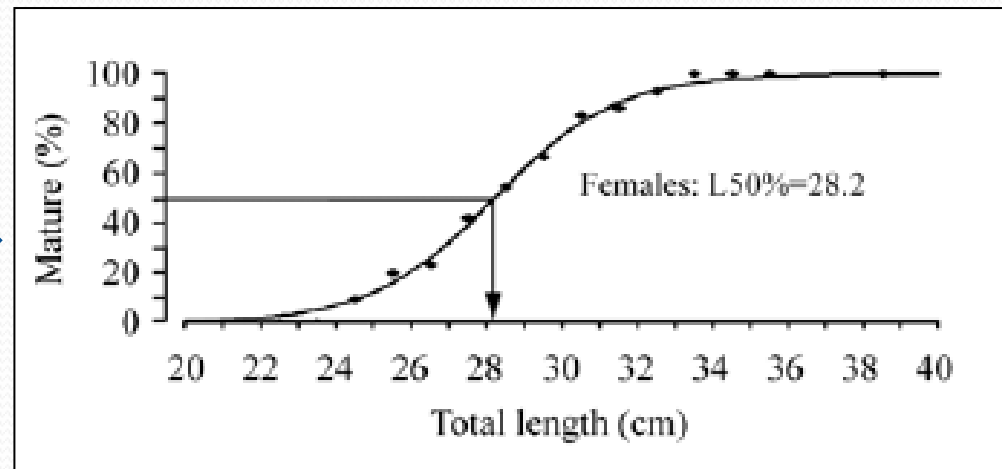
Mesure



Etat de maturité



Taille à la 1^{ère} maturité



Merci

