

**Report of the cruise
383 of the FRV Walther Herwig III
PREFACE – AWA cruise II
March 2 – April 24, 2015**

Scientist in charge: Dr. Heino O. Fock

Summary

133 stations were sampled during WH383 comprising inter alia 18 deployments for deep sea fisheries, 3 oceanic 24 h-stations with combined plankton, hydrographical and fisheries sampling, and 55 coastal plankton stations in the upwelling area of Morocco, Mauretania, and Senegal. First results are shown. A students course was conducted at UCAD/ Dakar.

Résumé

133 stations ont été échantillonnées au cours WH383 comprenant notamment 18 déploiements de pêche en eaux profondes, 3 24 h-stations océaniques avec le plancton combinée, l'échantillonnage hydrographical et de la pêche, 55 stations de plancton côtières dans la région d'upwelling du Maroc, la Mauritanie et le Sénégal. Les premiers résultats sont affichés. Un cours des étudiants a été menée à l'UCAD / Dakar.

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TI – Personalreferat Braunschweig
TI - Institut für Fischereiökologie
TI - Institut für Ostseefischerei Rostock
TI – FIZ-Fischerei
TI - PR
MRI - BFEL HH, FB Fischqualität
Dr. N. Rohlf/SF - Reiseplanung Forschungsschiffe
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Doggerbank Seefischerei GmbH, Bremerhaven
Deutscher Fischerei - Verband e. V., Hamburg
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Aim

Cruise WH383 pursued three objectives:

- (1) The first leg of the cruise addressed ichthyoplankton assemblages in the coastal upwelling in the Canary Current Large Marine Ecosystem (CCLME) from Morocco to Senegal.
- (2) The second and third leg of the cruise aimed at deep-sea pelagic ichthyofauna investigations in oceanic waters from about 0°N to 45°N, including studies on reproduction of midwater fishes and food web structure in terms of stable isotope analysis (SIA).
- (3) To support the UCAD Dakar graduate program while providing Walther Herwig III as platform for an UCAD students course and workshop at sea. This was planned and executed in close cooperation with UCAD and LABEP-AO, Prof. Papa Ndiaye.

Cruise narrative

Weather conditions were very good during the cruise, so that the complete program could be fulfilled (Fig. 1 as overview). The cruise started in Bremerhaven/Germany. First port in Africa was Dakar after accomplishing the first leg in coastal waters of Morocco, Mauritania and Senegal. The work comprised ichthyoplankton sampling with GULF sampler and Multinet, and CTD casts (Fig. 2 for CTD stations).

In Dakar, the German Embassy gave a reception on board the Walther Herwig III on March 21. Ambassador Bernard Kampmann welcomed more than 60 guests.

UCAD course day was on March 22. Nine students took part, together with lecturers from the graduate program at UCAD (University Cheikh Anta Diop).

The second leg started on March 23, leaving the Senegalese EEZ heading for the Equator. Besides plankton sampling with Multinet and CTD casts, deep sea fisheries was conducted during night time. Two 24-h stations were conducted, one in the oxygen minimum zone off West Africa, and one at the Equator. Leg 2 ended in Mindelo, April 5. Leg 3 covered the section from the Cap Verde islands to the Bay of Biscay, including one 24-h station at the Cap Verde Ocean Observatory (CVOO).

Sampling

CTD casts

84 stations with CTD casts were sampled, accompanied by bottle samples. Not all stations during leg 1 could be samples due to malfunctions in the ctd body. Additionally, a LADCP was mounted to the CTD basket.

Ichthyoplankton, mesoplankton

Sampling at 55 stations in the upwelling area (see Fig. 1) was carried in round the clock-operations to a depth of 5 m below thermocline. Maximum operation depth was ca. 200 m. Ichthyoplankton sampling was carried out with a modified GULF sampler ('Nackthai', 300 µm), accompanied by depth stratified sampling along transects off Banc d'Arguin with the Multinet.

Oceanic 24-h station

The GULF sampler was replaced by a vertically towed Multinet, mesh size 300 µm. CTD casts, Multinet hauls and deep-sea trawls were conducted twice a day.

Deep-sea trawling

Remaining deep-sea trawling (18 stations) was carried out during night time in the mesopelagic zone between 700 and 30 m water depth (Fig. 5). Cephalopods were analysed by Henk-Jan Hovig, GEOMAR.

First results

Fig. 3 shows the hydrography along the transect from the Equator to the Bay of Biscay. Warmest water was encountered at low latitudes, while the most saline water was found passing the Canary Current System.

Intensive upwelling was present in the entire coastal section. Figures 4 and 5 exemplify different patterns of larval distributions in the area. Whereas larvae of *Hygophum macrochir*, an oceanic myctophid, utilized waters along the shelf edge no further north than Banc d'Arguin, sardine larvae were only found in the northerly part of the investigation area. Analysis done by Maik Tiedemann, TI-SF.

Of particular interest are first studies on reproduction of *Electrona risso*, another oceanic myctophid sampled during legs 2 and 3. Different stages of maturity were encountered during WH383. Figure 6 shows stage 6, with immature and already well developed though not fully hydrated oocytes as well as POFs indicating spawning within the last couple of hours. The work of Kim Wieben, GEOMAR, allows to characterize *Electrona risso* as determinate iteroparous batch spawner, i.e. the number of eggs is determinate, with probably two spawning periods each separated into a number of batches.

Investigations on food web structure in the deep-sea community indicate significant regional differences. Fig. 7 shows pairwise SI patterns for a number of mesopelagic fishes from the oxygen minimum zone (green) and the Equator (yellow). The N15 pattern is indicative of the trophic position of each species. Analysis done by Stephanie Czudaj.

Data availability

CTD, and hydro-acoustic data are available to all cruise participants by Feb. 2016, ichthyoplankton data from the AWA project will be made available after analysis has been accomplished.

Acknowledgements

The Thünen Institute is deeply grateful to all who have contributed to this successful cruise: fisheries departments and authorities in Morocco, Mauritania, Senegal, Cabo Verde, Spain, Portugal and France and port authorities in Dakar and Mindelo, Ambassador Bernard Kampmann and the staff of the German Embassy in Dakar as well as crew and management of the FRV Walther Herwig III for their excellent support during the cruise.

Cruise participants

Name and affiliation

Leg 1

Dr. Heino Fock	Cruise leader	TI_SF, Hamburg
Stephanie Czudaj		TI_SF, Hamburg
Maik Tiedemann		TI_SF, Hamburg
Luc Badji		LABEP-AO
Kim Wieben		GEOMAR
Maxim Sell		TI_SF, Hamburg
Florian Luskow		TI_SF, Hamburg
Tarik Baibai	Observer Morocco	INHR
Bejih Sameta	Observer Mauritania	IMROP
Lt. Papa Ndiaye	Observer Senegal	Senegal. Navy

Leg 2 & 3

Dr. Heino Fock	Cruise leader	TI_SF, Hamburg
Stephanie Czudaj		TI_SF, Hamburg
Maik Tiedemann		TI_SF, Hamburg
Luc Badji		LABEP-AO
Kim Wieben		GEOMAR
Maxim Sell		TI_SF, Hamburg
Florian Luskow		TI_SF, Hamburg
Lydia Kohlmorgen		TI_SF, Hamburg
Tim Kirchner		TI_SF, Hamburg
Henk-Jan Hoving	Only leg 2	GEOMAR

Leg 3

TI_SF
LABEP AO
GEOMAR
INHR MAR
IMROP MAU

Thünen-Institute of Sea Fisheries
Fisheries Inst. UCAD, DAKAR
Helmholtz Centre for Ocean Research Kiel
l'Institut national de recherche halieutique , Morocco
l'Institut Mauritanien de Recherches Océanographiques et des
Pêches, Mauritania

Dr. Heino O. Fock



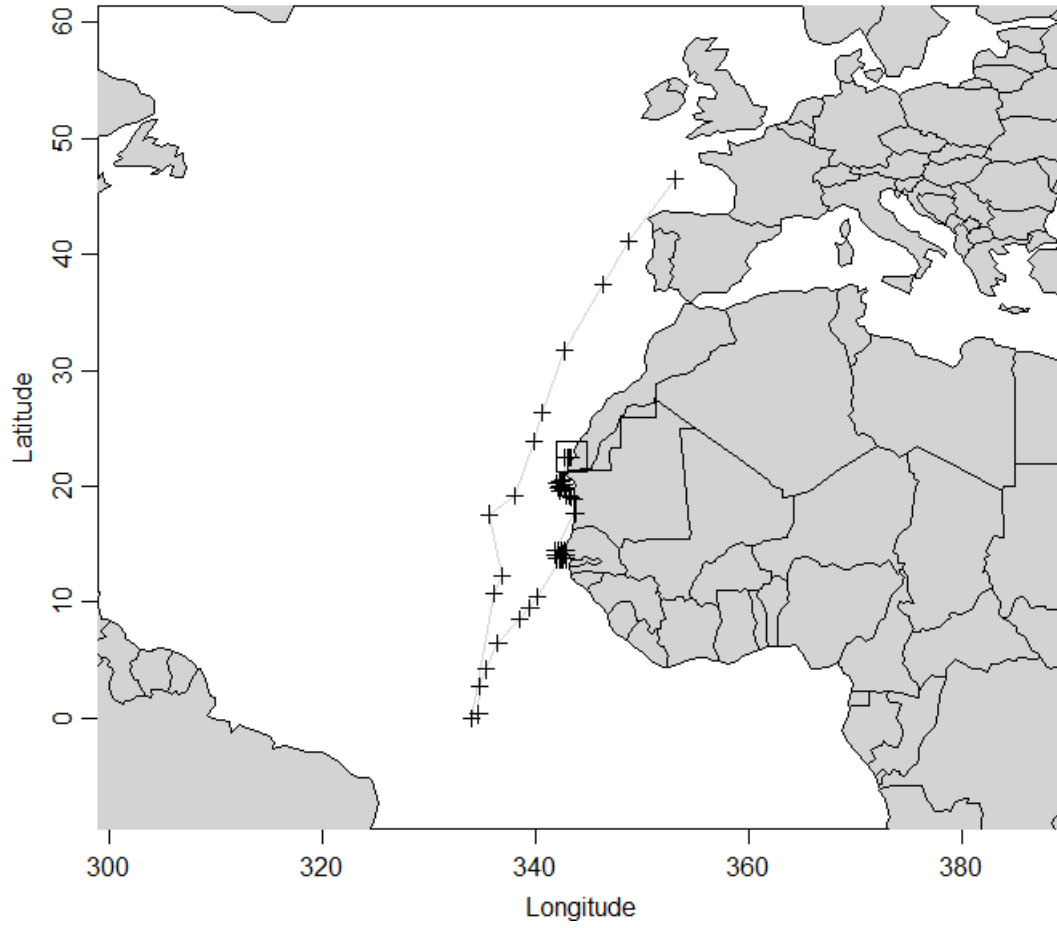
Figures**Fig. 1: WH383 CTD station plot - overview**

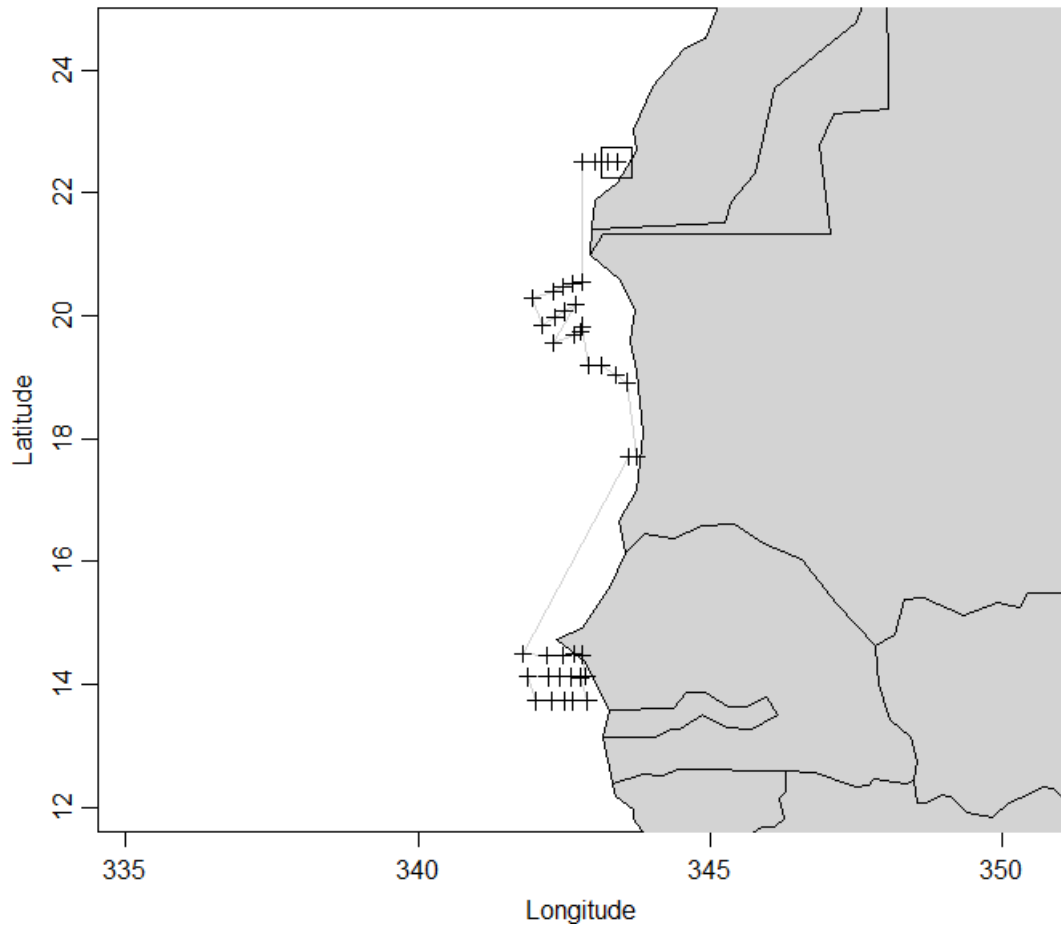
Fig. 2: WH383 CTD station plot – coastal leg 1

Figure 3 : Latitudinal transect with temperature, salinity, density and station plots.

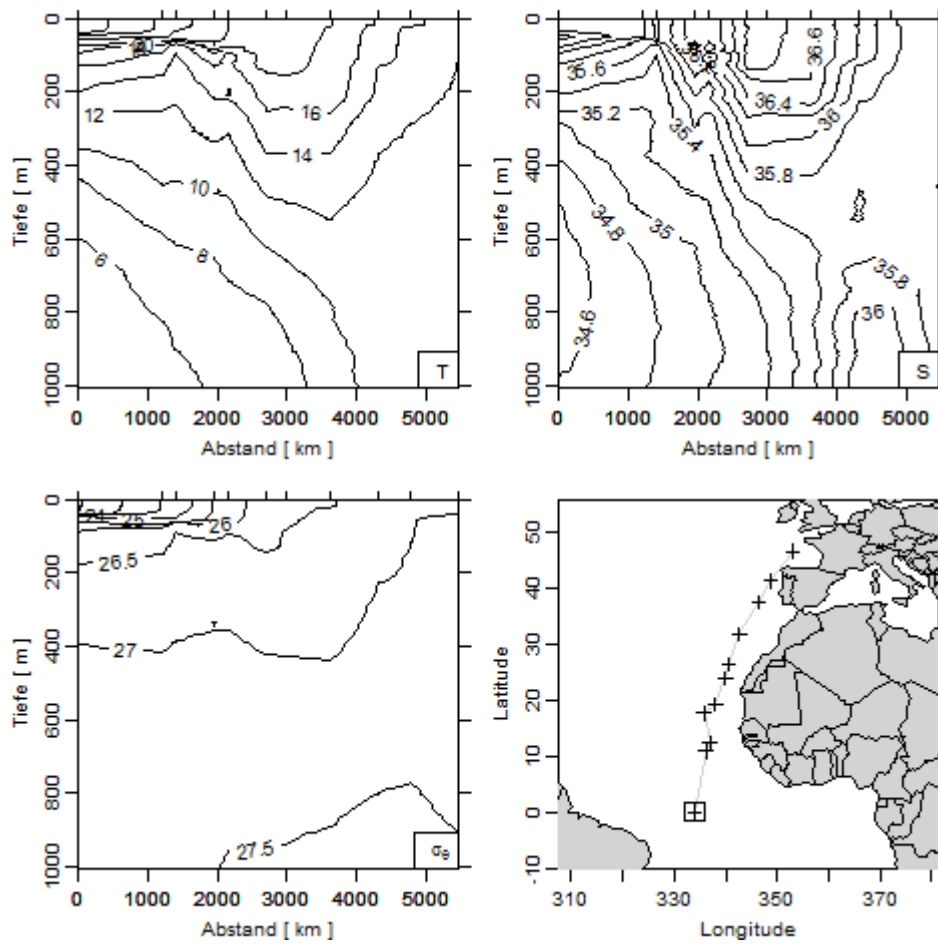


Figure 4 : *Hygophum macrochir*, larvae in the upwelling section

Source: Maik Tiedemann

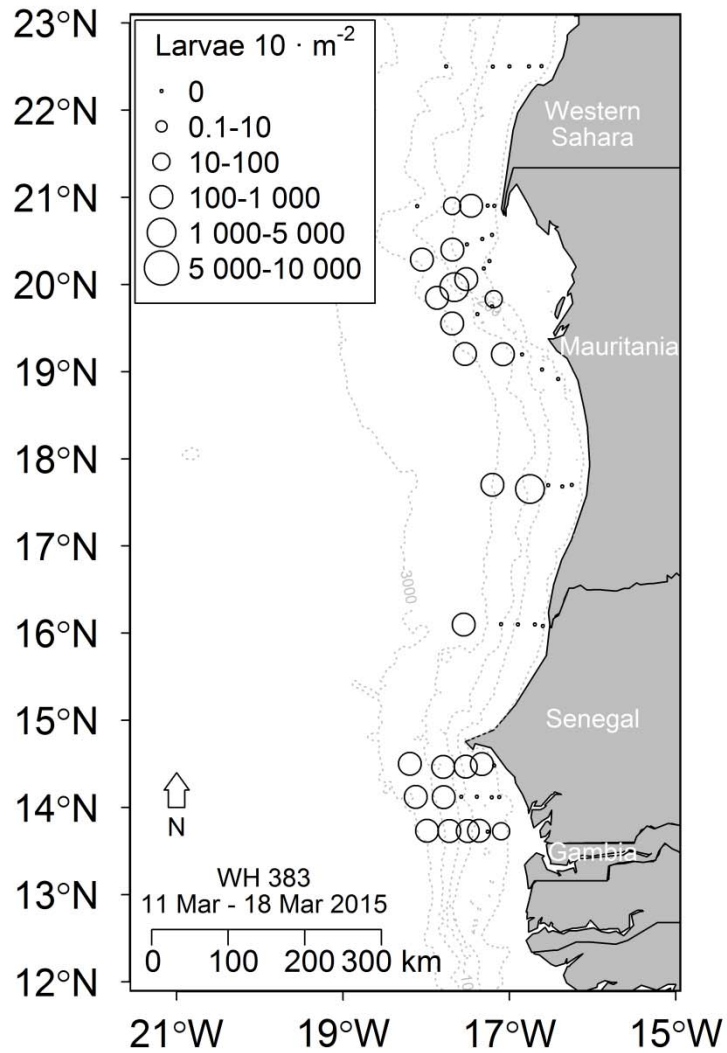


Figure 5 : *Sardina pilchardus*, larvae in the upwelling section

Source: Maik Tiedemann

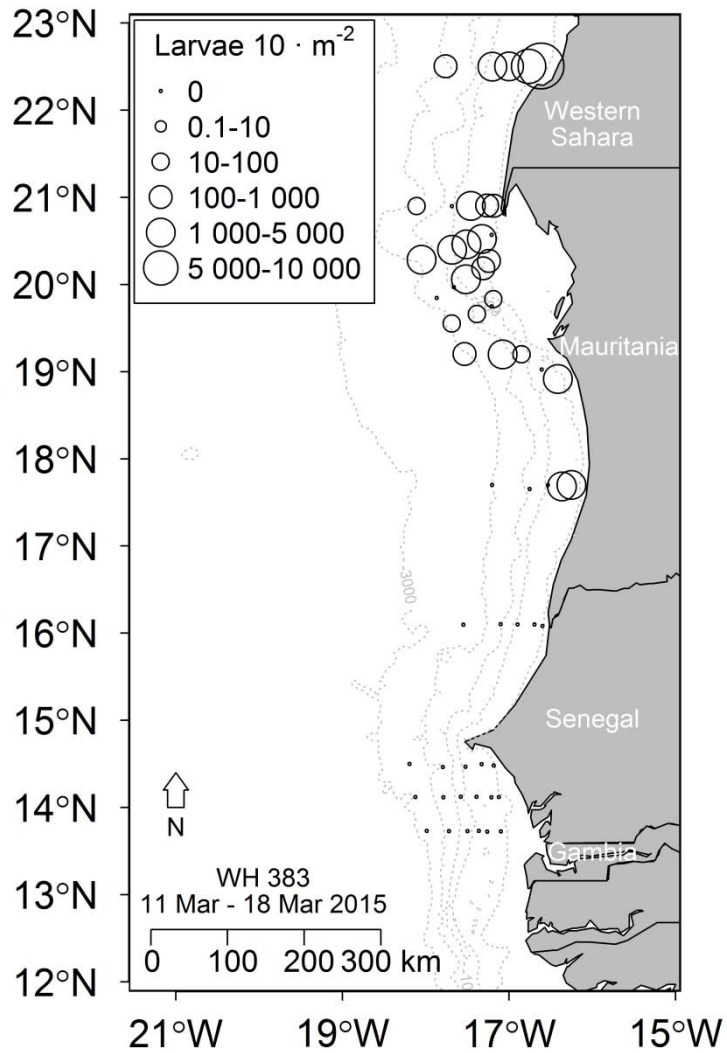


Figure 6 : Histological sections of ovaries of *Electrona risso*, stage 6.

Source: Kim Wieben

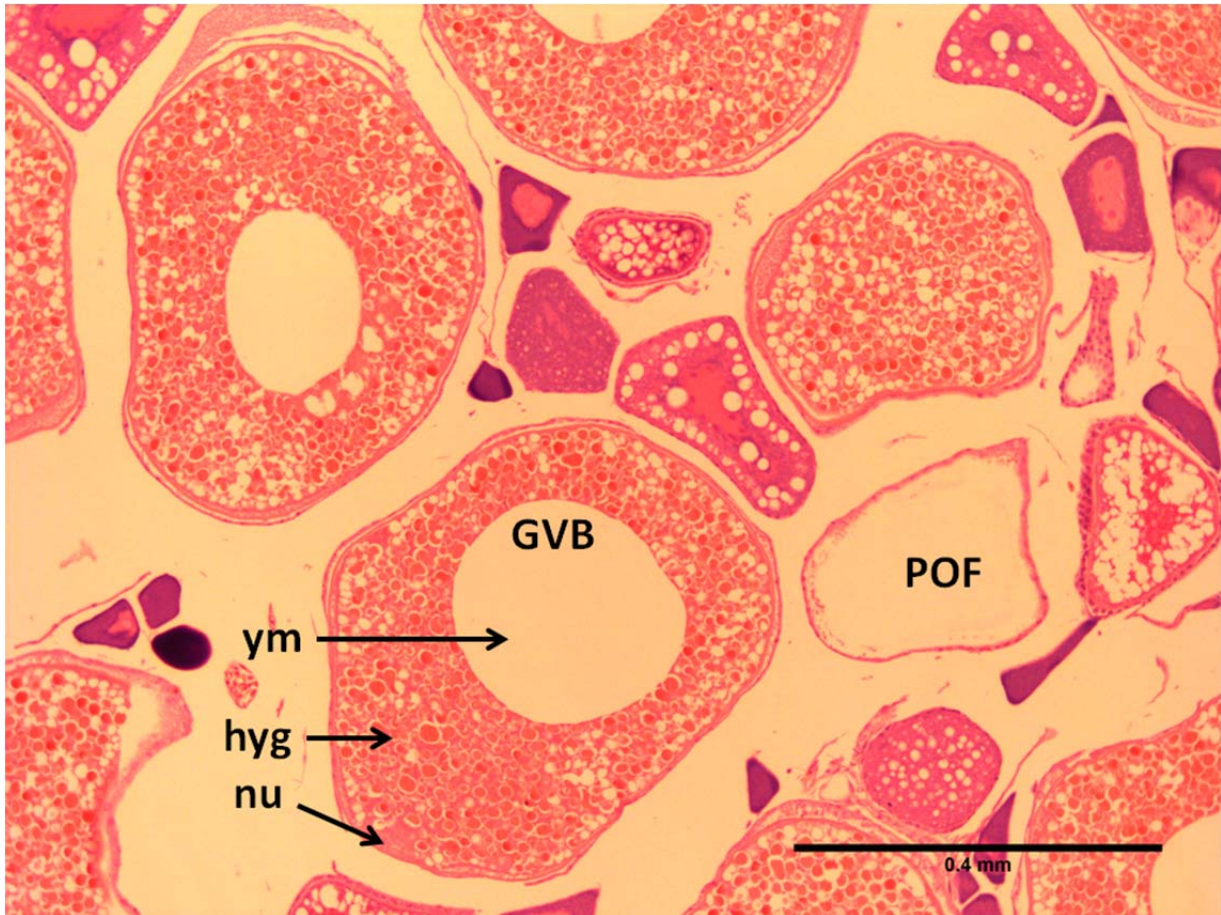


Fig. 6: Histological sections of ovaries, stage 6, stained with HE and sectioned at 2 μ m.

A= atretic oocytes, CA= cortical alveoli oocyte, ca= cortical alveoli, GVB =germinal vesicle (nucleus) breakdown oocyte, HYD= hydrolyzed oocyte, hyg= hydrated yolk granules, MN= migratory nucleus oocyte, nu= nucleus, OG= oogonia, PG= primary growth oocyte, POF= postovulatory follicle, VTG1-3= primary to tertiary vitellogenic oocyte, yg= yolk granules, yv= yolk vesicles. Scale bar: 0.4 mm (*Photography: Wieben*)

Figure 7 : N15 pattern for selected species from two regions, i.e. oxygen minimum zone (green) and Equator (yellow).

Source: Stephanie Czudaj

