



## History of *Artemia* activities in Africa

Wednesday, May 4 2022, 1400 – 1600h East Africa Standard Time (GMT+3)

### Webinar Report

#### Background

Kenya Marine and Fisheries Research Institute (KMFRI) in partnership with the International *Artemia* Aquaculture Consortium (IAAC) hosted a webinar on the History of *Artemia* in Africa on 4<sup>th</sup> May 2022. This was necessitated by the fact that *Artemia* production has been ongoing on the continent for more than four decades, similar to Asia, but without any distinctive levels of success. The world demand for *Artemia* cysts has continued to increase and annual consumption is now estimated at 3,500 – 4,000 tonnes with Asia being the largest producer and consumer globally while Africa lags behind in both production and utilization, despite *Artemia* having been introduced on the two continents at the same time. Diverse levels of *Artemia* activities in different African countries were presented, to take stock of where the continent is, explore opportunities and address the various challenges impeding the production and utilization of artemia for improved livelihoods and overall aquaculture development in Africa.

#### Summary of the webinar

The webinar attracted participation of 153 individuals from 25 countries in Africa, Asia, Europe and America (see annex 1 for list of participants). It was structured into two segments, country presentations followed by a Question and Answer session (The program is in Annex 2). While introducing the webinar objectives, Prof Patrick Sorgeloos indicated that this was under the auspices of the IAAC and aligned to recommendations from the *Artemia* Aquaculture workshop held on 22nd September 2021 (a side-event of the 2020 Global Conference on Aquaculture, Shanghai-China). The genesis of *Artemia* production in Kenya under the Bilateral project between the Republic of Kenya and Kingdom of Belgium (1984-1986) and subsequent developments to date were highlighted. In Tunisia, it was indicated that *Artemia* research started in 1921 and existence has been reported in 25 sites. Inoculation with other strains has never been done and the country needs new approaches to enhance cyst production. Occurrence and research work in Libya, Uganda, Tanzania, South Africa, and Mozambique were also presented. Notably, there is no natural occurrence of *Artemia* population in Uganda, but growth experiments have been performed using inland waters from Lake Bunyampaka and further trials on tank and pond production, and later inoculation in the wild will follow. On the other hand, *Artemia* was introduced

in Tanga-Tanzania through a Kenyan salt company (Kensalt Ltd) but awareness and technical expertise are limiting factors. Cyst production in Mozambique was on a gradual rise but an outbreak of white spot disease in shrimp farms between 2011-2012 affected demand. With no market, the *Artemia* demonstration farm in Mozambique was converted to a trial farm for *Oreochromis mossambicus*. *Artemia* activities have also been reported in other countries such as Algeria, Botswana, Eritrea, Madagascar and Namibia as presented during the webinar.

The webinar Q&A session centred around the following topics;

- Presence of native *Artemia* species before introduction of *Artemia franciscana* in Kenya
- Diversifying the use of *Artemia* other than aquaculture through value addition techniques (e.g. as human food - "fried *Artemia* patties)
- Current market outlet for locally produced cysts in Kenya
- Performance of different variants/genotypes of *Artemia* i.e. growth, response to environmental stress
- Production of *Artemia* as a secondary product for salt farmers and whether the two production systems run in parallel
- Need to undertake a scoping study to better understand issues and bottlenecks for *Artemia* culture in different African countries in order to develop a robust *Artemia* value chain.
- Possibilities of commercialization of *Artemia* production (large scale) by investors under the Blue Economy initiative in Kenya. What is it that we can borrow from the leading exporters e.g. China?
- Mechanism being explored by KMFRI/Government to secure a solution to land-tenure issues that are affecting artisanal *Artemia* pond production at the Kenyan coast?
- Need for a comprehensive understanding of the value chain dynamics before commercialization, with lessons from Mozambique
- Production dynamics (production output per unit area, annual production from the natural populations)
- Balancing between biomass harvesting and population regeneration
- Potential of bulk *Artemia* production in all Ugandan saltwater lakes
- Freshwater *Artemia* production

### Next steps

It is evident that there have been efforts to develop an *Artemia* industry in Africa, with reports on occurrence dating back to 1921 in Tunisia, to inoculation in salt production ponds in Kenya in 1984. Production has however failed to reach its full potential as compared to Asia. There are lessons to learn, such as ready locally-driven market through operational marine hatcheries and mariculture farms, to coordinated and collaborative regional efforts to optimize production. Knowledge exchange through the IAAC consortium is therefore necessary for a cohesive understanding of regional dynamics and developing a robust industry that will redefine the mariculture sector in Africa for improved livelihoods. This would be complemented by an *Artemia* Reference

Centre for Africa that will act as an information repository and technical knowledge exchange for the region.

### **Acknowledgement**

The host would wish to thank the presenters and attendees for their valuable time, the International Artemia Aquaculture Consortium (IAAC) for considering KMFRI to host the webinar. The Western Indian Ocean Marine Sciences Association (WIOMSA) is acknowledged for sponsoring the Webinar through the Optimizing Artemia Production Technology for Sustainable Aquaculture Development (APTSAD) project, Food Security and Economic Growth for the East African Coastal Communities project.

## ANNEX 1: List of Participants

	Name	Organization	Job Title	Country/Region Name
	<b>Panellists</b>			
1	Mary Opiyo	Kenya Marine and Fisheries Research Institute		Kenya
2	Sam Ngete	Kenya Marine and Fisheries Research Institute		Kenya
3	Romdhane Mohamed			Tunisia
4	Eric Ogello	Maseno University		Kenya
5	Gilbert Van Stappen	University of Ghent		Belgium
6	Martin Sswerwadda	Mountain of The Moon University		Uganda
7	Joseph Rasowo	Technical University of Mombasa		Kenya
8	Eddy Naessens	Inve Aquaculture		Belgium
9	Patrick Sorgeloos	University of Ghent		Belgium
10	Rafael Rafael	Aquaculture Research Center (CEPAQ)		Mozambique
11	Imani Kapinga	Tanzania Fisheries Research Institute		Tanzania
12	Betty Nyonje	Kenya Marine and Fisheries Research Institute		Kenya
13	Morine Mukami Ngarari	Kenya Marine and Fisheries Research Institute		Kenya
14	Simon Wilkinson	Network of Aquaculture Centres in Asia-Pacific		Thailand
15	Eric Okuku	Kenya Marine and Fisheries Research Institute		Kenya
16	Hinzano Sheban	Kenya Marine and Fisheries Research Institute		Kenya
17	Francis Okalo			Kenya
	<b>Attendees</b>			
1	Sidi Mohammed Ghomari	Université De Mostaganem	Enseignant	Algeria
2	Marwan Elkrewi	ISTA	Phd Student	Austria
3	Beatriz Vicoso	ISTA	Prof	Austria
4	Khiya James	N/A	N/A	Austria
5	Kennedy Oyier Ngoko	Laboratory of Aquaculture and Artemia Reference Center	MSc. Aquaculture Student	Belgium
6	Jonathan Lugho	UGent	Aquaculture Intern	Belgium
7	Brett Laudato	Ghent University	Student	Belgium
8	Maryann Ngunjiri	Ghent University	Student	Belgium
9	Marcos Rogerio Camara	Federal University of Rio Grande do Norte (UFRN)	Professor	Brazil
10	Nen Phanna	Fisheries Administration	Researcher	Cambodia

11	Liying Sui	Tianjin University of Science and Technology	Professor	China
12	Fanny Wang	Asia	Sales Manager	China
13	Sharon Lubembe	Université Officiéll De Bukavu	Student	Congo
14	Mariam Gomaa	General Authority for Veterinary Services	Veterinarian	Egypt
15	Dibar Dagne Tafa	Arba Minch University	Lecturer	Ethiopia
16	Rodgers Makwinja	Addis Ababa University	Researcher	Ethiopia
17	Amare Mezgebu	Bahir Dar University	Lecturer	Ethiopia
18	Bantalem Anley	University	Lecture	Ethiopia
19	Clementine Lasne	Istaustria	Posdtoc	France
20	Csir-Water Institute	CSIR-Water Research Institute, Ghana	Aquaculture Research	Ghana
21	Joseph	Ishe Maricos	Consultant Scientist	India
22	Xiaowei Zhou	FAO	Aquaculture Officer	Italy
23	Alessandro Lovatelli	FAO UN	Aquaculture Officer	Italy
24	Mirriam Wainaina	Kenya Marine & Fisheries Research Institute	Research Officer	Kenya
25	David Kamau	N/A	N/A	Kenya
26	Zaccheaus Maganga	Set Your Roots Organization	Director	Kenya
27	Linah Velma	Lbda	Fisheries	Kenya
28	Norah Magangi	Kenya Marine and Fisheries Research Institute	Technician	Kenya
29	Charles Opanga	Kenya Fisheries Service	Fisheries Officer	Kenya
30	David Midumbi	Kenya Marine and Fisheries Research Institute	Research Assistant	Kenya
31	Elijah Kembenya	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
32	Derrick Gitari	Kenya Marine and Fisheries Research Institute	Intern	Kenya
33	Esther Wairimu Gikonyo	Kenya Marine and Fisheries Research Institute	Research Officer	Kenya
34	Spencer Ogot	Kefs	FO	Kenya
35	Edwin Muga	Fisheries Directorate, County Government of Kisii.	County Director of Fisheries	Kenya
36	Rajab Masha	State Department for Fisheries Aquaculture and The Blue Economy	Fisheries and Blue Economy Officer	Kenya
37	Oscar Ikinya	Oscariots Investments	Director	Kenya
38	Peter Michael Oduor-Odote	Kenya Marine and Fisheries Research Institute	Principal Research Scientist	Kenya
39	Benson Kiiru	KENYA FISHERIES SERVICE	Laboratory Technologist	Kenya
40	Roselyne Kibogo	Kenya Marine and Fisheries Research Institute	Intern	Kenya
41	Daisy Nyawira	Kenya Marine and Fisheries Research Institute	Intern	Kenya

42	Immaculate Kinyua	Kenya Marine and Fisheries Research Institute	Research Associate	Kenya
43	Josyline Kendi	Kenya Marine and Fisheries Research Institute	Assistant Research Scientist (Aquaculture Eng)	Kenya
44	Mohamed Salim	Migombani Organic Farm	Founder \ Director	Kenya
45	Mavindu Muthoka	Maseno University	Student	Kenya
46	Mavindu Muthoka			Kenya
47	Veronica Wanjeri	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
48	Bramwel Mukaburu	Maseno University	Student	Kenya
49	Nicholas Gichuru	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
50	Frank	Kenya Marine and Fisheries Research Institute	Internship	Kenya
51	Paul Baraka	Kenya Marine and Fisheries Research Institute	Intern	Kenya
52	Winnie Atieno	Nation Media Group	Journalist	Kenya
53	Wilfred Zablon	N/A	N/A	Kenya
54	Solomon Otieno	Kenya Marine and Fisheries Research Institute	Student	Kenya
55	Cynthia Nyanguru	Kenya Marine and Fisheries Research Institute	Research Scientist Intern	Kenya
56	Diana Anyoso	Kenya Marine and Fisheries Research Institute	INTERN	Kenya
57	Young Guda	Technical University of Mombasa	Student	Kenya
58	Alex Kimathi	Kenya Marine and Fisheries Research Institute	Research Officer	Kenya
59	Domitila Kyule	Kenya Marine and Fisheries Research Institute	Researcher	Kenya
60	Lillian Daudi	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
61	Lillian Daudi	Kenya Marine and Fisheries Research Institute		Kenya
62	Damaris Kinyua	Pwani University	PhD Researcher	Kenya
63	Victor Omondi	Egerton University	Student	Kenya
64	Fonda Awuor	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
65	Robert Ondiba	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
66	Moses Muga	University of Eldoret	Volunteer Agriculture Field Officer	Kenya
67	Dr. John Kochey Kipyegon	National Museums of Kenya	Senior Research Scientist	Kenya
68	Venny Mziri	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
69	Wambui Mburu	Ghent University	Student	Kenya
70	Amahwa Charles	Kenya Marine and Fisheries Research Institute	Intern	Kenya

71	Fridah Munyi	Kenya Marine and Fisheries Research Institute	Research Scientist	Kenya
72	Suzanne Njeri	Kamiti Fish	Director	Kenya
73	Jane Wangenye	Kenya Marine and Fisheries Research Institute	Research Associate	Kenya
74	George Ndiritu	Karatina University	Lecturer	Kenya
75	Elizabeth Obado	University of Eldoret	Research Assistant	Kenya
76	Ramtu Kassim	Kibuyuni Seaweed Farmers	SEAWEED FARMING	Kenya
77	Nancy Mwiti	Kenya Marine and Fisheries Research Institute	Intern - Public Relations	Kenya
78	Dominic Kimani	Kipeto Energy	Lead Ornithologist	Kenya
79	Africa Konnect	Africa Konnect	Founder	Kenya
80	Benson Furaha	Kaduhoni Self-Help Group	Records Keeping Manager	Kenya
81	Nicholas Karani	Kenya Marine and Fisheries Research Institute	Research	Kenya
82	Jane Nderu	Chuka University	Student	Kenya
83	Alexander Fulanda	Kenya Marine and Fisheries Research Institute	Technologist	Kenya
84	Kelvin Osotsi	Kenya Marine and Fisheries Research Institute	Intern	Kenya
85	Jonathan Munguti	Kenya Marine and Fisheries Research Institute	Director Aquaculture KMFRI	Kenya
86	Numious Kiti	Farm Africa	Master Trainer	Kenya
87	Messias Macuiane	Freelance Consultant	Aquaculture Expert	Mozambique
88	José Artur Marcelino	Universidade Eduardo Mondlane University-ESUDER	Professor	Mozambique
89	Ruben Hallen	FSF	Manager	Namibia
90	Abiola Durojaiye	Olabisi Onabanjo University, Ago-Iwoye	Lecturer	Nigeria
91	Mabel Omowumi Ipinmoroti	Osun State University	Teaching and Research	Nigeria
92	Babatunde Musa	Federal College of Fisheries and Marine Technology Lagos	Senior Lecturer	Nigeria
93	Osas Adeniyi		Researcher	Nigeria
94	Nwabueze Agatha	Delta State University Abraka	Lecturer	Nigeria
95	Ajayi Cosmas	Federal College of Freshwater Fisheries Technology	Technologist	Nigeria
96	Mosunmola Lydia Adeleke	FUTA	Researcher	Nigeria
97	Abisoye Babalola	Agricultural Research Council of Nigeria, Mabushi, Abuja, FCT.	Chief Research Scientist	Nigeria
98	Bello Abdullahi	Al Mubashir Global Enterprises	CEO	Nigeria
99	Onimisi Hassan Umaru	National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria, Nigeria	Fisheries Extension Specialist	Nigeria

100	Kemisola Osakuade	University of Ibadan	Phd Candidate	Nigeria
101	Foluke Areola	G.W&L Consults Ltd	Consultant	Nigeria
102	Liudmila Litvinenko	Northern Trans-Ural State Agricultural University	Professor of The Department of Aquatic Bioresources And Aquaculture	Russia
103	Francisco Hontoria	Instituto De Acuicultura De Torre De La Sal (IATS-CSIC)	Tenured Scientist	Spain
104	Juan Carlos Navarro	IATS, CSIC	Research	Spain
105	Mythily Kesarajan	NARA	Scientist	Sri Lanka
106	Chathuranga Pradeep	NARA	Scientist	Sri Lanka
107	Kartik Baruah	Swedish University of Agricultural Sciences	Associate Professor	Sweden
108	Nazael Madalla	Ministry of Livestock and Fisheries	Director of Aquaculture	Tanzania
109	Siwema Luvanga	Tanzania Fisheries Research Institute	Researcher	Tanzania
110	Flower Msuya	Zanzibar Seaweed Cluster Initiative	Senior Researcher	Tanzania
111	Alistidia Mwijage	Tanzania Fisheries Research Institute (TAFIRI)	Researcher	Tanzania
112	Ali Kurtulus	www.Fidesartemia.Com	CEO	Turkey
113	Sandra Langi	Muni University	Lecturer	Uganda
114	Elias Muhumuza	National Fisheries Resources Research Institute (Nafirri)	Fishery Biology Technician	Uganda
115	Ivan Abaho	National Agricultural Research Organisation	Aquaculture Research Scientist	Uganda
116	Charles Mulamata	African Aquaponics Community Fish Farmers Cooperative	Chairman	Uganda
117	Kazeyi Dean	KDLG	Fisheries Officer	Uganda
118	Ronald Lulijwa	NARO-Uganda	Dr.	Uganda
119	Nelson Kasigwa	NARO	Researcher	Uganda
120	Gerlad Kwikiriza	National Agricultural Research Organization	Scientist	Uganda
121	Stefanie Lobnig	Aquanzo	CTO	United Kingdom
122	Anne Maundu	Kenyatta University	Lecturer	United Kingdom
123	Geert Rombaut	INVE Aquaculture	Product Manager	United States
124	Krishnamurthy D	Etelint	Aquaculture Consultant	United States
125	Gladys Asingo	Kenya Marine and Fisheries Research Institute	Project Manager	Kenya
126	Frank Martorana	Great Salt Lake Brine Shrimp Cooperative	Global Business Development & Technical Support Manager	United States
127	Ariana Macon	ISTA	Research Technician	United States



128	Behrang Daneshkhah	Artemia	Phd Student	United States
129	Benard Olweny	Fisheries Department	Fisheries Officer	Kenya
130	Titus Apiyo	Ghent University	Student	Belgium

## ANNEX 2: PROGRAM

Time	Topic	Speaker
14:00	Welcome remarks	<b>Dr. Eric Okuku</b> , KMFRI Mombasa Centre Director
14:05	Aim of the workshop	<b>Prof. Patrick Sorgeloos</b> , Artemia Reference Center, Belgium
14:10	Introduction of Artemia in Kenya	<b>Prof. Rasowo</b> , Technical University of Mombasa, Kenya & <b>Eddy Naessens</b> , INVE Aquaculture, Belgium
14:20	History of Artemia activities in Kenya	<b>Ms. Morine Mukami</b> , Kenya Marine and Fisheries Research Institute
14:30	History of Artemia activities in Morocco	<b>Noura Hanif</b> , Laboratory Nutrition and Marine Products, Chouaib Doukkali University, Morocco
14:40	History of Artemia activities in Tunisia	<b>Mohamed Salah Romdhane</b> , National Institute of Agricultural Sciences of Tunisia
14:50	History of Artemia activities in Libya	<b>Gilbert Van Stappen</b> , Artemia Reference Center, Ghent University, Belgium
15:00	History of Artemia activities in Egypt	<b>Prof. Nagy El-Bermawi</b> , Faculty of Agricultural (Saba bache), Alexandria University, Egypt
15:10	History of Artemia activities in Uganda	<b>Dr. Martin Serrwanda</b> , Mountains of the Moon University, Uganda
15:20	History of Artemia activities in Tanzania	<b>Dr. Imani Kapinga</b> , Tanzania Fisheries Research Institute (TAFIRI), Tanzania
15:30	History of Artemia activities in Mozambique	<b>Dr. Rafael Rafael</b> , Aquaculture Research Center (CEPAQ, Mozambique)
15:40	History of Artemia activities in South Africa	<b>Prof. Horst Kaiser</b> , Rhodes University, Grahamstown, South Africa
15:50	History of Artemia activities in Algeria, Eritrea, Namibia, Madagascar and Botswana	<b>Prof. Patrick Sorgeloos</b> , Artemia Reference Center, Ghent University, Belgium
16:00	Q&A, discussion, conclusions, and recommendations	Panellists
16:25	Closing remarks	<b>Simon Wilkinson</b> of the Network of Aquaculture Centres for Asia and Pacific (NACA)