

PROCEEDINGS OF THE 1st PEARL SYMPOSIUM

KINGDOM OF BAHRAIN, 2019

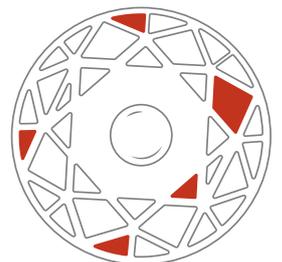


THE PEARL SYMPOSIUM

1st EDITION - KINGDOM OF BAHRAIN 14 - 15 NOVEMBER 2019

دانات

DANAT



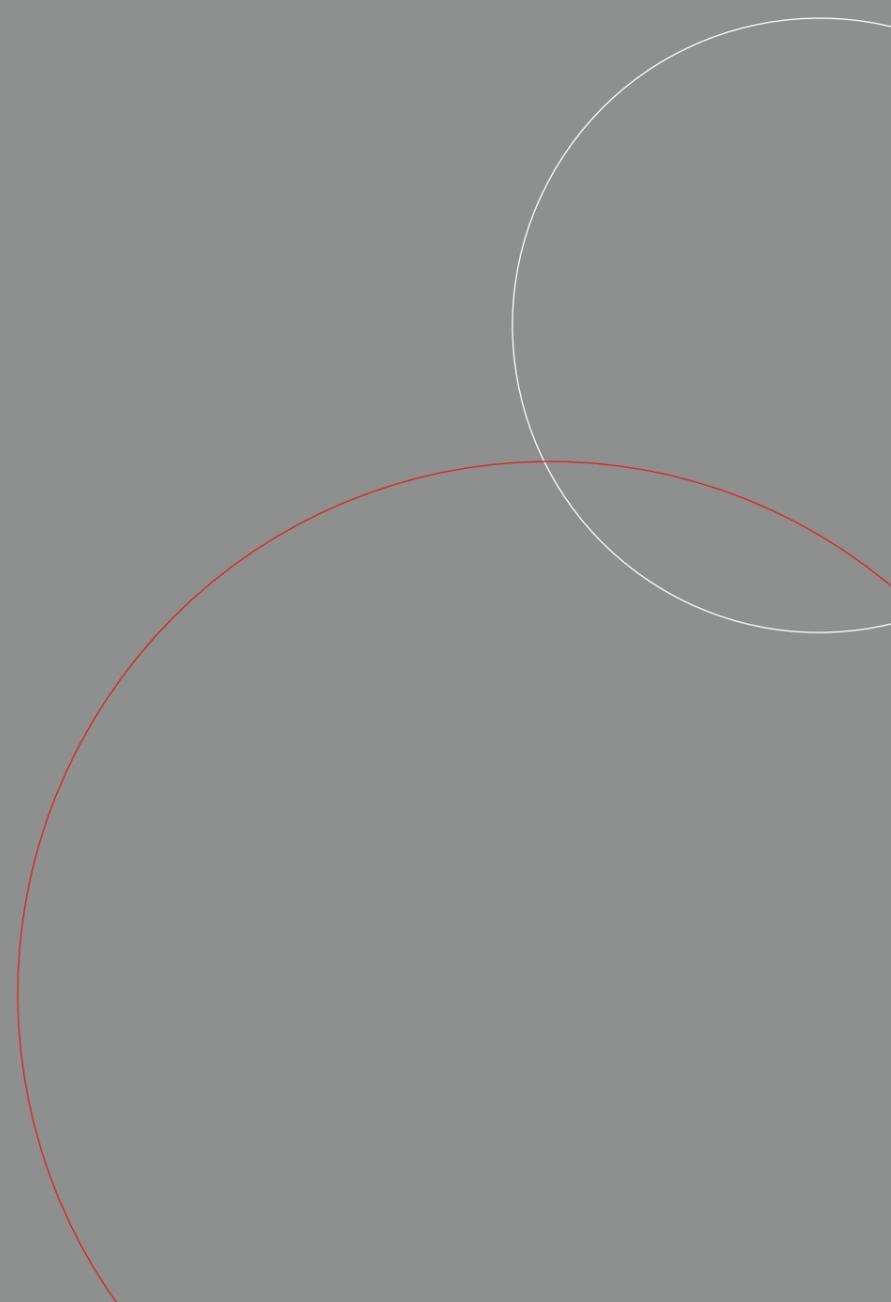
معهد البحرين للؤلؤ والأحجار الكريمة

BAHRAIN INSTITUTE FOR PEARLS & GEMSTONES



TABLE OF CONTENTS

About The Pearl Symposium	01 - 02
Message from CEO	03 - 04
Speakers & Abstracts	05 - 36





ABOUT THE PEARL SYMPOSIUM



THE PEARL SYMPOSIUM

1st EDITION - KINGDOM OF BAHRAIN 14 - 15 NOVEMBER 2019

The Pearl Symposium 2019 is the first formal gathering of its kind. The symposium is designed to bring together technical, professional and market experts to discuss current research, challenges and ongoing solutions in the pearl industry as well as the environment. Bahrain is committed to the protection of the trade of natural pearls as well as the close monitoring of the environmental impact of the industry. The revival and preservation of the natural pearl trade is of the utmost importance to Bahrain and its wider community.

Attendees of the Pearl Symposium 2019 will enjoy variety of talks, discussions and panels from local and international experts, directors, institute founders, company presidents and owners, professors, environmental experts, researchers and academics in the field, all of whom have a central and committed goal of protecting the natural pearling trade, environment and future of the industry.

Technical, professional and market experts will enjoy this platform to discuss a variety of issues, such as, the history of the global pearling industry and trade, the story of natural pearls from the Americas, the cultured pearl industry, seed pearl challenges, the classification of natural pearls with nacre, new frontiers in pearl analysis and groundbreaking methods in pearl species determination. Local experts talks will center around Bahrain and its aquatic environment, the pearl oyster resources of Bahraini waters, the trade of Bahraini pearls as well as the exploration of antique and museum pearls.

MESSAGE FROM THE CEO

Noora Jamsheer

On behalf of The Bahrain Institute for Pearls and Gemstones, DANAT, I would like to welcome all of our local and international guests attending the first International Pearl Symposium . It is a privilege and honor to host the world's leading experts in pearls in Bahrain, the world's home for natural pearls.

Bahrain's historical prominence in the pearl industry is a journey that started hundreds of centuries ago, before the times of Alexander the Great and the tale of Tylos. Today's venue choice is not a coincidence. We choose to organize the first International Pearl Symposium close to the Pearl Trail, which was proclaimed a UNESCO World Heritage Site in 2015, as a testament to Bahrain's mark in the history of pearls.

Today, at a time when synthetic diamonds are threatening the well-being of the luxury market industry, Bahrain stayed true to nature and to natural pearls. The Pearl Symposium 2019 looks to reinstate the importance of natural pearls in the worldwide luxury market by bringing in a panel of experts to study the importance of natural pearls in preserving the environment. The panel will also witness the launch of the first-ever grading mechanism for natural pearls, a tool that will standardize the classification of natural pearls, in time before the build-up of the pearl trading markets. Similar to the 4Cs's for diamonds, the DANAT classification system will surely develop the pearl trade.

We welcome each and every Industry expert from across the globe and hope that you fall in love with the historical marvel of the ancient pearling industry and trade in Bahrain.



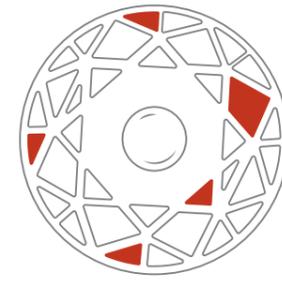


**SPEAKERS &
ABSTRACTS**



دانات

DANAT



معهد البحرين للؤلؤ والأحجار الكريمة

BAHRAIN INSTITUTE FOR PEARLS & GEMSTONES

Bahrain Institute For Pearls & Gemstones (DANAT)

Bahrain Institute for Pearls and Gemstones (DANAT) was established in 2017, under the aegis of HRH Prince Salman bin Hamad bin Isa Al Khalifa, Crown Prince, Deputy Supreme Commander and First Deputy Prime Minister of the Kingdom of Bahrain. It was formed as a wholly owned subsidiary of the Bahrain Mumtalakat Holding Company (Mumtalakat), the sovereign wealth fund of the Kingdom. Its vision is to become the world's preferred institute for natural pearls and gemstones' third party verification services and scientific research.

As a reflection of Bahrain's ancient pearling history and the strong desire to protect this heritage, DANAT was established as the guardian of global gemmological excellence. It plays a vital role in ensuring, protecting and enhancing public trust in pearls, gemstones and jewellery. DANAT is an authority on industry standards, scientific knowledge and education, and is committed to maintaining the highest standards of professional and personal ethics.



Abeer Al-Alawi
Executive Director, Bahrain Institute for Pearls & Gemstones (DANAT)

Abeer Al-Alawi is a specialised gemmologist with over 25 years' experience in the pearl and gemstone testing industry, having held various positions in Bahrain. Her career began in 1992 as a hallmarking specialist at Assay followed by a move to the Gem and Pearl Testing Laboratory of Bahrain. In 2003, she was promoted to Head of the Gem and Pearl Testing Laboratory, a position she held for 10 years. In 2014, she became the Director of Precious Metal & Gemstones and held the position for 3 years before moving to DANAT.

She holds a BA (Hons) degree in Jewellery Design & Silversmithing from Buckinghamshire University in UK, diploma in Diamond Grading from the Gemological Institute of America (GIA) and a diploma in Gemmology: Fellow Gemmological Association (FGA), Gem-A Institute, The Gemmological Association of Great Britain, London, United Kingdom. She is also a Certified Diamond Grader (CDG) HRD Antwerp in Belgium.

Challenges Facing The Testing of Seed Pearls

Abeer Al-Alawi, Ali Alatawi, Dr. Stefanos Karampelas & Kenneth Scarratt

Bahrain Institute for Pearls & Gemstones (DANAT) WTC East Tower, Manama, Bahrain
abeer.alalawi@danat.bh

The definition of seed pearls as per the CIBJO Pearl book is "a small salt or freshwater natural pearl which is generally less than two but no more than three millimeters in diameter". Saltwater and freshwater, seed pearls have been used in jewellery adornments throughout history, in addition to other uses in medicine and cosmetics. The Kingdom of Bahrain has long been known in the Arabian Gulf region for the use of seed pearls in a majority of its traditional jewellery designs (Figure 1). Bahrain is the only country in the world which by law bans the trade or display of cultured pearls. Therefore, for such pearls to be sold in the market, it is very important that these are tested to ensure their natural origin before use in jewellery items. This has been a great challenge ever since the Gem and Pearl Testing Laboratory of Bahrain (GPTLB) which was established in 1988. Due to the difficulty of testing these pearls via film X-ray microradiography, seed pearls were submitted as bunches during the 1990's and were X-rayed and tested randomly. If the percentage of cultured pearls in the random sample of rows exceeded 10%, the pearls were classified as (FAIL) and returned to the customer or Customs Directorate; without allowing them to be sold in the country. After several complaints from the jewellers regarding the percentage of cultured passed pearls, this was reduced to 5%. However, due to the law this percentage was not mentioned on the certification. In 1997, large quantities of seed pearls used to enter Bahrain from different sources. After investigation, the GPTLB concluded that these quantities were non-bead cultured saltwater pearls, a by-product of pearl cultivation (also known as "keshi cultured pearls"), coming from different farms world-wide. Using film X-ray microradiography, they showed various structures that included irregular or hair-line non-bead tissue voids/cavities. Some samples were not showing much internal structures to confirm their identity and others with radial growth patterns with rich organic material and white cores which were different from those visualized in natural pearls. This issue created massive problems in the pearl trade in Bahrain as natural seed pearls formed an important part of the countries heritage in the jewellery sector (Figure 1). In 2010, the concerns about the difficulties faced in testing the different cultured pearls internal structures was discussed during the CIBJO Congress 2010 held in Munich (Germany). This was followed by a second meeting in Bahrain organized by GPTLB with the LHMC Pearl Committee in June 2010. The committee finally concluded that when testing strands of pearls/bunches/hanks that are all under 3mm in size the report should state "Seed Pearls" noting that seed pearls may be either natural or cultured. At present, with the introduction of high-resolution real-time digital X-ray microradiography instruments, the internal pearl structures are more visible and easier to identify and these samples can be better characterized.



Figure 1: A traditional yellow-metal belt with numerous seed pearls and coloured gems. Photo: Ghadheer Adhali, DANAT. Courtesy: Al Zain Jewellery.



HE Dr. Mohammed Bin Daina
Chief Executive, Supreme Council for Environment, Kingdom of Bahrain

Dr. Mohamed Mubarak Bin Daina is currently serving as the Chief Executive of the Supreme Council for Environment (SCE). Prior to his appointment, he was the Deputy Chief Executive of the SCE. At this post, he is mandated to cover a number of national environmental issues including air quality, climate change, environmental impact assessment, pollution control, waste management land resources, and marine and coastal conservation. Dr. Bin Daina has led delegations relevant to the Montreal Protocol, The United Nations Framework Convention on Climate Change and various regional and international environmental conferences and summits. A double-honoree by His Majesty King Hamad Bin Isa Bin Salman Al Khalifa, Dr. Bin Daina received his PhD in Chemical Engineering from Imperial College London and earned his Postgraduate Certificate in Academic Practice from York St. John University. He has also been awarded a Fulbright Scholarship by Texas A&M. His extensive academic background includes a Bachelor's of Science in Petroleum Engineering from the United Arab Emirates University, and a Master's of Science in Chemical Engineering from the University of Wales, Swansea. With a background in petroleum engineering from Bahrain National Oil Company, Dr. Bin Daina started his professional career as a Graduate Assistant in the faculty of Chemical Engineering at the University of Bahrain, eventually becoming an Assistant Professor and later Director of Accreditation of Quality Assurance. Dr. Bin Daina has recently been appointed board member of the Education & Training Quality Authority. He is also a member of the following national committees: Supreme Council for Civil Defense, National Renewable Energy Committee, National Committee for Data and Information, Bahrain Building Code Committee, Emergency and Hazardous Committee. He is also a member at the executive-committee of UNEP for special project.

Bahrain and its Aquatic Environment

HE Dr. Mohammed Bin Daina

Building Number 3550, Road 2849, Block 428, Floor 13, Public Relations Department, Seef Area
 mbindaina@sce.gov.bh

It is important to note that Bahrain's biodiversity is of valuable socio-economic and cultural importance due to the numerous ecosystem services provided which are vital for human well-being such as food, water, air purification and coastal protection to name just a few. In addition, various habitats such as the freshwater springs and palm groves have also contributed towards defining Bahrain's identity and name today.

In 2017 Bahrain launched the national plan to revive the pearl industry after studies showed that insufficient harvesting in previous years led to the loss of vast numbers of oysters from the Kingdom's oyster beds due to overpopulation. Accordingly, a series of measures and initiatives have been put in place to regulate pearl diving.

The plan focuses on the following areas: promoting and regulating pearl diving, protecting Bahrain's oyster beds, strengthening Bahrain's status as a global center for natural pearls, and developing the national pearls and gemstones laboratory, Danat, into a global center for examination and assessment.

In order to maintain a sustainable oyster population, the Ministry of Works, Municipalities and Urban Planning issued a Ministerial Order to regulate the procedures to obtain a pearl diving license (for Bahrainis only), and to set the criteria and rules that dive centers must meet in order to operate pearl diving trips for tourists and Bahrainis alike. Unlike anywhere else in the world, local and foreign tourists on sanctioned trips have the option to keep or sell any pearls that they find. As part of the plan, Bahrain also established Danat, a world-class pearl and gemstones testing facility, in 2017. Anyone who finds a pearl in Bahraini waters is encouraged to get it examined, tested and certified by Danat as a natural saltwater pearl.

In strengthening efforts to protect oyster beds in the northern part of the Kingdom (Hayr Bul Thama, Hayr Bu Ammamah, Hayr Shtayyah; Figure1), the SCE issued two orders in 2017 (2,3) to improve site protection and efficiently regulate fishing and other maritime activities. The orders cover Najwat Bul Thama, the three oyster beds, and a buffer zone around the oyster beds – all of which are designated as a UNESCO World Heritage Site – to improve protection, covering a total area of 1336km². The orders set out rules and regulations for each designated area, depending on the ecosystem.

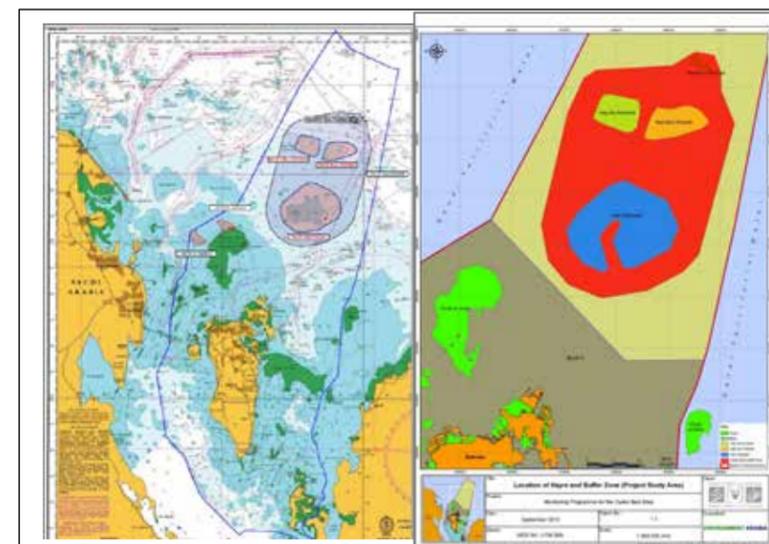


Figure 1: Location of Hayr Bu-I-Thamah (orange), Hayr Bu 'Amamah (yellow) and Hayr Shtayyah (blue) and the Buffer zone



Rui Galopim de Carvalho
Founder, Portugal Gemas Academy

Rui Galopim de Carvalho FGA DGA, is a passionate gemmologist with an active social media presence focusing on the spread of accurate knowledge and appreciation of gemstones. He is currently Vice-President of the Coral Commission and Vice-President of Sector A for CIBJO (The World Jewellery Confederation). An accomplished author, Rui has published research on the history and use of gem materials with a focus on Portuguese Jewellery studies across the National Museums and treasures of the Church. He is a speaker at a number of international gemological events and an experienced education consultant. Rui is a member of the Communications Committee of ICA (International Coloured Gemstone Association), associate editor of Gem-A's peer reviewed Journal, The Journal of Gemmology, and Advisory Counsel of the Portuguese Jewellery Association, which includes the selection committee for licensed Jewellery Appraisers in Portugal.

A review of Antique and Museum Pearls

Rui Galopim de Carvalho

Portugal Gemas, Lisbon, Portugal
ruigalopim@gmail.com

Pearls have been collected as adornments since pre-history as supported by archeological evidence in the Gulf namely the "Umm al-Quwain pearl" [1] and the "Abu Dhabi pearl" found in the UAE and dated sixth millennia BCE. Recent research in Baja California, Mexico, also found 8,500 years old pearls [2]. Molluscs, however, have been thriving for more than 550 Ma and some have produced pearls that remain as rare fossils in Museum collections [3]. Gulf pearls, namely from the local *Pinctada radiata*, have been recorded during Roman times and the following Byzantine period [4]. In the Imperial Crown of the Holy Roman Empire (10th century), a fine example of the lavish use of pearls in highly symbolic artefacts, the pearls are, however, reportedly from freshwater mussels (European pearl mussel - *Margaritifera margaritifera*) from central Europe [5], in line with local common practice until the upper Medieval period. In Russia, for example, freshwater pearls are well documented in both devotional and traditional items, e.g. kokoshnik, until 1917 [6]. It was curiously on freshwater molluscs, in this case the duck mussel (*Anodonta anatine*), that the first attempts to grow a whole cultured pearl were made by Karl von Linne in 1761 [7]. The opening of a sea route to the Orient by the Portuguese in the late-1400s had great impact in European luxury [8] with direct access to pearl producing centres in the Gulf and in Asia (Figure 1). At the same time, the Spanish were sourcing significant quantities of pearls in central America (e.g. *Pinctada imbricata*, *P. mazatlanica*) and by the 16th-17th century period, baroque shapes were superbly used to elaborate stunning pendants. Art Nouveau artists, namely René Lalique (1860-1945), were later known to recreate renaissance-style pearl drops in their art creations. Many famous pearls are kept in private and museum collections [9], namely the ca. 450 ct Hope pearl at the Nat. Hist. Museum of London and the 856.58 ct Danat Shaika Fatima bint Mubarak, currently at the Emirates Palace Hotel in Abu Dhabi, UAE. Auctions have seen rare and historical pearls, notably in items from Maharajas and Mughal period, in the matching pear-shaped Mancini Pearls pair, the stunning "La Peregrina" pearl that broke a record in 2011, being overthrown by Marie Antoinette's pearl pendant in 2018. There are pearls with historically relevant stories, namely the so-called Medici-Hanover pearls that can be traced back to Pope Clement VII in the 16th century with a very rich history, and the Mae Plant's pearl necklace by Cartier, often referred to in 1916 as the most perfect pearl necklace, that remained in history due to the unique terms of its transaction.



Figure 1: Enameled gold renaissance necklace with rubis and pearls. Germany, ca. 1590. Albion Art Institute collection. Photo © DANAT

References

- [1] Charpentier, V. et al., (2012). Pearl fishing in the ancient world: 7500 BP. *Arabian Archeology and Epigraphy*, no. 23, pp. 1-6.
- [2] Ainis, A. et al. (2019). The Antiquity of Pearl in the Americas: Pearl Modification Beginning at Least 8,500 Years Ago in Baja California Sur, México. *Latin American Antiquity*. Vol. 30, No. 3, pp. 637-643
- [3] Landman, N. H. et al., (2001). *Pearls: A Natural History*. American Museum of Natural History, New York
- [4] Strack, E., (2006). *Pearls*. Rühle-Diebener-Verlag, Stuttgart
- [5] Price, Andrew (2019). *Pearl Tales* (pers. comm.). Magnificent Pearls, DANAT, Bahrain
- [6] Strack, E. (2015). European freshwater pearls: Part 1—Russia. *The Journal of Gemmology*. vol. 34, no. [7] pp. 2-14
- [8] Asplund, J. (2018). Linnaeus and the Pearls. *Gems & Jewellery*. Vol. 27, no. 4, 28-29
- [9] Gschwend, A. J., (2015). *The Global City, on the streets of Renaissance Lisbon*. Paul Holberton publishing, London
- [10] Chadour-Sampson, B., (2013). *Pearls*. V&A Publishing, London

Pearling and the Environment – The Blue Pledge

Justin Hunter

J. Hunter Pearls, Savusavu Fiji.
jhunter@fijipearls.com

The Blue Pledge, which was born from the disaster of TC Winston and evolved through Fiji's Ocean and COP23 presidency, is an innovative platform that harnesses the environmental stewardship of responsible oceanic pear farming and the power of blockchain to catalyze private sectors philanthropy to support marine conservation and coastal community development in tropical oceans. The Blue Pledge provides a conduit for the private sector to engage and support global initiatives to mitigate and adapt to climate change that is affecting the oceans for forming a community along the supply chain from consumer to the pearls farms. It is a model that demonstrates private sector philanthropy can have a significant impact merging conservation and economic returns.

The founding members are three pearling companies from Fiji, Australia and the Philippines. The location of these three companies has special significance as they all operate in what is often known as The Coral Triangle, an area covering less the 0.01% of the earth's surface, yet home to an estimated 30-40% of the world's marine species and therefore represents the highest concentration of tropical marine biodiversity on earth. All three pearling companies are also active members of the CIBJO and its Pearl Commission Steering Committee.

- UN Oceans co-chaired by Fiji & Sweden June 7th 2017: Creating a Blue Industry Dr. Gaetano Cavalieri and Justin Hunter.
- The Blue Pledge, Climate Action Pacific Partnership Conference in Fiji August 2019, Peter Bracher Executive Director Paspaley Pearling Co. and Justin Hunter
- New York Climate Week 2019, Dr. Cartier, Christina Assael, Jewelmer, Justin Hunter with Mr. Peter Thomson UN Special Envoy for Oceans.
- Justin Hunter and Jonathan Landrey presented at Sustainable Blue Economy Conference 26th – 28th November 2018, Nairobi Kenya,
- COP24 Guest Speaker 24th Conference of the Parties to the United Nation Framework Convention on Climate Change, Katowice Poland: December 7th 2019.
- June 2019. Climate Action Pacific Partnership Conference.
- SUVA, July 10, 2019 – ABC's Future Pacifiaka, The University of the South Pacific (USP), in partnership with the World Bank Group: Healthy Oceans.
- 23-25 July 2019. Pacific Community Workshop on the UN Decade of Ocean Science for Sustainable Development 2021-2033. Pacific Community Headquarters, Noumea, New Caledonia.

Our vision consists of a pearl industry that actionably contributes to the health of our oceans and climate and can inspire consumers to engage with these important issues. Our 7-point pledge seeks to strengthen many of the Sustainable Development Goals outline by the United Nations. It includes: 1/Protection of the Biosphere, 2/ Sustainable Use of Natural Resources, 3/ Production Transparency and Product Disclosure, 4/ Develop and Operate Farms in a Socially and Culturally Responsible Manner, 5/ Management Commitment and Local Law Compliance, 6/ Blue Carbon Neutrality, 7/ Removal of Plastics and Investment in Renewables



Justin Hunter
Owner and Operator, Fiji Pearls

Founder and CEO of J. Hunter Pearls Fiji (est.1999, Savusavu Bay, Fiji). Justin's innovative leadership over the last two decades has placed the Fiji Pearl brand on the international stage alongside leading luxury jewellery brands. J. Hunter is renown for their prized yet limited bounty of unique natural hues that are sold exclusively to a small select group of international buyers. Committed to partnering with the traditional communities where his farms are located, Justin's pioneering vision for the industry, based on community owned and operated pearl farms, is encapsulated in The Fiji Pearl Development Plan he devised after experiencing the devastating effects of Cat. 5, tropical cyclone Winston that hit Fiji in 2016. Endorsed by CIBJO, the FPDP was presented at UN Headquarters in New York on World Oceans Day, June 2017 by the Fiji Government as one of its commitments to achieving Sustainable Development Goal 14, Life Below Water. Following on the heels of this achievement Justin instigated The Blue Pledge, a private sector driven initiative designed to raise more awareness around the world's only true sustainable gem. Partnering with top pearl producers and brands Paspaley and Jewelmer, the 7-point pledge seeks to support the UN's Sustainable Development Goals, reinforcing their role in developing a blue economy.



Dr. Stefanos Karampelas
Director of Research, Bahrain Institute for Pearls & Gemstones (DANAT)

Dr. Stefanos Karampelas is the Research Director for the Bahrain Institute for Pearls and Gemstones (DANAT). He holds an Advanced Gemmology Diploma from the University of Nantes (France), a PhD in Materials Physics from the same university, a MSc in Geosciences from the University of Rennes (France) and a BSc in Geology from Aristotle University of Thessaloniki, Greece. He has experience as a Research Scientist for a period of 7 years at Gübelin Gem Lab with a further year at Gem Research Swisslab, both in Switzerland. He is also a lecturer (since 2012) for the Advanced Gemmology Diploma at the University of Nantes, France, on pearls, laboratory methods applied to gems as well as origin determination of coloured gems. He has published numerous research papers on different gems in various scientific journals, contributed to books delivered various lectures and visited several gem mines and pearl producing areas around the globe. He is a delegate for the International Gemmological Conference (since 2011), member of the Commission of Gem Materials of International Mineralogical Association (since 2007) as well as member of the Editorial Board of Gems and Gemology and an Associate Editor of The Journal of Gemmology.”

Pearl Species Determination: Possibilities and Limitations

Dr. Stefanos Karampelas, Fatima Mohamed, Husna Alderazi & Abeer Al-Alawi

Bahrain Institute for Pearls & Gemstones (DANAT) WTC East Tower, Manama, Bahrain,
Stefanos.Karampelas@danat.bh

Several specific geographic origins of gems (e.g., diamonds from Golconda -India-, emeralds from Colombia, rubies from Burma, sapphires from Burma and Kashmir -India- as well as natural pearls from the Arabian Gulf) are linked to history, exotism, etc. and might play an important role in their monetary value. Geographic and mollusc origin are used by dealers as a kind of brand name. In parallel it assists in solving ethical issues related to gem mining, legal vs illegal fishing and sustainability issues as well as providing useful information for archaeologists, curators, etc., in order to better understand early trade routes. To perform origin determination solely non-destructive (or rarely minimally destructive -i.e., at micron level-) should be used. These methods, should also be cost effective in terms of equipment as well as human power. The geographic origin of natural (nacreous) pearls is not a new trend; it was first used by gem dealers around 16th century when the natural pearls coming principally from the Arabian Gulf used to be called “oriental pearls” and those coming from Central America “occidental pearls”. Today, several gemmological laboratories are sometimes mentioning in their reports the mollusc species where the natural (nacreous and non-nacreous) pearl was found in, rather than pearl’s geographic origin. This is performed after using a combination of classic gemmological tools (microscope and reaction under UV lamps) as well as sophisticated X-ray imaging (microradiography and micro-computed tomography), spectroscopic (e.g., UV-Vis-NIR, Photoluminescence and Raman) and chemical (e.g., LA-ICP-MS) methods; with which sometimes it is possible to identify natural nacreous pearls from *Pinctada radiata* (Figure 1) as well as pearls from CITES protected animals (e.g., *Lobatus gigas* -a.k.a. queen conch-). However, treatments (e.g., bleaching) small sized pearls, as well as unanswered yet questions on conspecificity are limiting natural pearls host mollusc origin determination.



Figure 1: A seven-row necklace made of 779 natural pearls from *P. radiata*. The pearls vary from round to near-round, with light cream colour and pink overtone, ranging from 3.80 to 8.40 mm in diameter. Photo: Ghadheer Adhali, DANAT. Courtesy: Al Mahmood Pearls.



PD Dr. Michael S. Krzemnicki
Director, Swiss Gemmological Institute (SSEF)

PD Dr Michael S. Krzemnicki, director of the Swiss Gemmological Institute SSEF started his gemmological career at SSEF after completion of his PhD thesis in mineralogy in 1996. He was appointed director of Education in 2001 and deputy director in 2007. Since 2009, he is the director of the SSEF, worldwide reputed as leading laboratory for the testing of coloured stones, diamonds and pearls. Apart from working at the SSEF, PD Dr Krzemnicki is lecturing at the Earth Sciences Department of the University Basel (Switzerland) and is supervising gemmology-related research projects in collaboration with Swiss universities and international research laboratories. As an internationally renowned expert he is regularly speaker at gemmological conferences worldwide and has published numerous articles in all major journals on gems, pearls, and new analytical testing methods. Furthermore, he has been appointed member of the Scientific Board of the Swiss Gemmological Society SGS, Member of the Editorial Review Board of the Journal of Gemmology, member of the Executive Board of the International Gemmological Conference IGC, and member of the Technical Board for the standardisation of Fei Cui (Jadeite) testing by the Hong Kong Council for Testing and Certification.

New Frontiers in Pearl Analysis: Age Dating, DNA Fingerprinting, and Novel Radiographic Methods

PD Dr. Michael S. Krzemnicki

Swiss Gemmological Institute SSEF, Aeschengraben 26, 4051, Basel, Switzerland
michael.krzemnicki@ssef.ch

This talk will present new and innovative methods to analyse pearls and shows how they can be used to provide supporting evidence for a pearl's identification and distinction between natural and cultured formation.

Radiocarbon age dating (^{14}C) is a widely used scientific technique for dating organic matter (trees, tissues, etc.) and carbonaceous materials such as charcoal and biomineralization products. By using an in-house developed sampling method, we are able to carry out radiocarbon age dating with only 0.01 ct nacre taken from the drill-hole ("quasi non-destructive"). By this, we were able to date pearls recovered in the famous Cirebon shipwreck off Java in Indonesia (11th century AD) among other historic natural pearls. Radiocarbon age dating is especially useful for the analysis of historic pearls, as it may shed light on their historic provenance and also may uncover forgeries combining old mountings with recently formed pearls.

In 2013, research by SSEF and ETHZ discovered for the first time DNA in organic matter within pearl nacre, thus allowing the separation of pearls (and mother-of-pearl) from different *Pinctada* species. This talk will present the current status and methodological capabilities of DNA fingerprinting on pearls from a range of pearl producing oyster species (including *Pinctada margaritifera*, *Pinctada maxima* and *Pinctada radiata*). Recent research led to the development of a DNA sequence reference database of seven *Pinctada* oyster species to assign any of their pearls to the exact species by using only a minute sample quantity of jewellery-quality pearls, thus allowing us to offer conclusive identification of pearl species as a service to the trade.

Still today, visualisation of internal structures of pearls is crucial to understand their formation and as such to draw an expert conclusion whether it is a natural or cultured pearl. Apart from classic X-ray transmission (attenuation) radiography and micro-tomography, we have integrated novel radiography and tomography methods for pearl testing to have access to more detailed information about internal structures in pearls.

These new methods include X-ray phase contrast and darkfield (scattering) imaging which are especially powerful to visualise growth structures, cracks and void structures. In addition, we have explored the capabilities to use neutrons as excitation (SINQ spallation neutron source). Neutron radiography and tomography offer unique additional imaging capabilities, as pearls (matter) absorb neutrons completely different compared to X-rays. As a result, it is thus possible to investigate in much detail the organic-rich zones in a pearl (e.g. in a central cavity), something impossible with classical X-ray radiography.

Pearl testing in a gemmological laboratory is a complex procedure, in which traditional and sophisticated scientific methods have to be combined. By exploring novel testing methods, we are working towards a better understanding of pearls and their formation, finally with the aim to support the pearl trade with our foremost scientific knowledge and expertise.



Gina Latendresse
President, American Pearl Company Inc. of Nashville Tennessee

From the time Gina Latendresse was a young child, she was immersed in the world of pearls because she is the daughter of the late John R. Latendresse, who was considered to be one of the world's foremost experts on pearls – natural and cultured – as well as the “Father of American Pearls.” Her earliest memories include traveling to trade shows and grading pearls. Her pearl journey covers almost half a century (forty-four years) during which time she gained an unrivalled background of the pearl industry, both for cultured and natural, and she was inspired to join her family business as the focus of her professional life. She graduated from Rhodes College in Memphis, Tennessee with a “Bachelor of Arts” (BA) degree. She continued her education at the Gemological Institute of America (GIA). In 1991, she was appointed President of American Pearl Company. Carrying on her father's legacy including a love of natural pearls, along with an amazing collection acquired over his lifetime, Gina also specializes in rare natural pearls, specifically from the Americas, the Tennessee & Mississippi river and its tributaries, and highly sought-after pearls such as the rare purple quahog pearls, abalone pearls, and conch pearls.

The Lustrous Mysteries of American Natural Pearls

Gina Latendresse

American Pearl Company, Inc, 2120 Crestmoor Road, Suite 3020, Nashville, Tennessee 37215 USA, (615) 243-6655 mobile, (615) 298-4111 Office
ginalatendresse@gmail.com

Dating back to the 1500s, European royal families considered natural pearls harvested in the New World to be among the rarest and most prized of all things, even exceeding the value of gold and emeralds. Once the New World – the Americas – were discovered, they sent their Armadas in search of her distinctive and unique pearls, especially those harvested from the lakes and rivers of North America (Figure 1), and we can find numerous examples among the antique pieces in the Royal Collection of England, Spain and Portugal. We can also see numerous examples of these pearls featured in the dramatic Art Nouveau, delicate Edwardian, and geometric Art Deco designs as well as the whimsical Mid-Century designs. Today, we will “dive” into the life cycle of North American freshwater molluscs to understand the widespread mussel population, and explore the natural freshwater pearling history, industry, regulations and its impact on jewelry and jewelry design throughout the years.



Figure 1: Bank Climber molluscs from Tennessee River, natural purple colour with eight natural pearls.

Studies on the Pearl Oyster, *Pinctada radiata*, Resources of Bahrain Waters

Dr. Mohamed Al Rumaidh

House 2602, Road 1042, Madinat Hamad 1210, Kingdom of Bahrain
Mj.alrumaidh@gmail.com



Dr. Mohamed Al Rumaidh Researcher & Academic in Marine Biology & Ocean Science

Dr. Mohamed AlRumaidh, received a MSc Degree in Shellfish Biology, Fisheries & Culture, in 1996, and PhD Degree in Marine Biology, in 2002, both from the University of Wales, Bangor, UK. He joined the Directorate of Fisheries in 1983 as a marine biologist, and was involved in marine environmental studies, such as oil pollution, dredging and coastal reclamation operations, as well as mangrove studies. In 1986, he was appointed Project Manager to run the Pearl Oyster Resources Survey in Bahraini waters, which was conducted by the ex-Bahrain Centre (BCSR) for Studies and Research from 1986 to 1990. He then continued with BCSR as a Fishery Researcher where he was involved in conducting research works on living marine resources, and published several papers on shellfish marine species, i.e. pearl oysters; shrimps; and crabs, as well as, an annotated bibliography on Fisheries Publications of Bahrain, from 1960s through to the first half of 2005. From 2011 to 2016, he was an Assistant Professor of Marine Biology and Oceanography, in the Dept. of Biology, University of Bahrain.

A preliminary survey of the pearl oyster beds of Bahrain was conducted by ex-Bahrain Centre for Studies and Research (BCSR) during August 1985. The purpose of that expedition was to determine the status of the pearl oyster in these beds after 30 years during which the oyster beds were not exploited. Based on the results of the survey a steering committee was formed in February 1986 to plan a detailed survey and decide policy matters. BCSR had purchased a survey vessel "Danet Al Bahrain" and aqualung equipment and employed researchers and divers to run the survey which was carried out from March 1986 through to January 1987. Since the results were encouraging it was decided to carry out a detailed study to further investigate the pearl oyster beds. This work was conducted from March 1987 to December 1989. Objectives of the expedition were: (1) determining the size and density of the oyster populations on the off-shore pearl oyster beds which were known previously during pearl fishery era, (2) exploring the frequency of occurrence and quality of natural pearls, (3) understanding the environmental conditions on the pearl oyster beds, viz. temperature; salinity; pH; dissolved oxygen, (4) exploring spawning season and their periodicity by means of plankton samples and spat settlement technology, (5) investigating producing pearls from the natural beds through culture. Work was mainly concentrated on the major pearl oyster beds in the northern and northeastern regions, viz. Bu Amamah, Bu Lthama, Bljaal, Almiyanah, Blkharub, Shutayah, Arjlah, Bu Sowar, Shiqita, Bu Hagul, and Shutayah. Results revealed that oysters exist in millions in all oyster beds, with the highest number of oysters were found in Bu Amamah, Bu Lthama, Bljaal, Almiyanah, Blkharub, oyster beds, where the density were recorded around five oysters per square metre. Despite the high number of oysters, quantity and size of pearls obtained were not encouraging. In terms of quantity of pearls, the incidence was found 4.7 pearls for every 100 oysters. It was found that diameter of 94.4% of pearls were less than 3 millimeters, where pearls bigger than the aforementioned size were reported negligible (Figure 1). The incidence of pearls obtained from oyster beds: Bljaal, Blkharub, Arjlah, and Almiyanah, were found the highest with 7.9%, 4.6%, 4.5%, 4.3%, respectively. Results of the plankton samples had indicated two spawning seasons for pearls oyster, a prolong season during the summer months (June-September) and quite short spawning activity occur in November-December. The Experimental study of the settlement and collection of spat of the pearl oyster, was very successful and encouraging. Spat collectors made of local row material such as oyster shell rens, nylon rope, coir rope, steel wire, fruit baskets, wooden frames, were laid during the month of July 1989 at different selected off-shore locations, viz. Fasht Aljarim, Khawr Fasht, Bouy no. 3 (navigation channel) and off Ras Hayan coast. Profuse settlement of spat took place at few places; however, the best location and material for spat collection appeared to be Fasht Aljarim and oyster shell rens, respectively. The outcomes that were obtained from the spat settlement study had provided further evidence that the major spawning season of the local pearl oyster species, occur during summer months. Concurrently with the survey of the pearl beds, the possibility of utilizing the local species of pearl oyster to produce cultured pearls, was also explored. The success achieved in producing cultured pearls on an experimental scale was followed by organising training courses for secondary school teachers to disseminate the pearl culture technology in Bahrain.

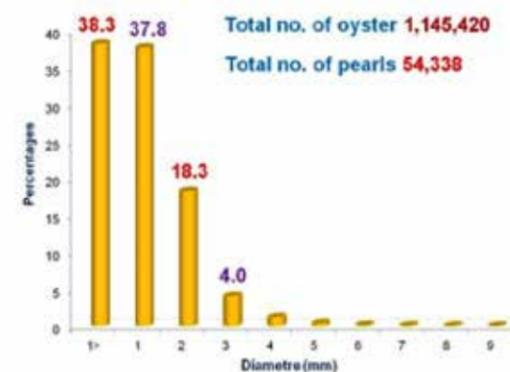


Figure 1: Distribution pattern of different size groups of pearls obtained from the pearl oyster beds in Bahrain waters

Trade in Bahraini Pearls

Ali Al Safar

Shop Number 2, Building 317, Road 329, Block 301, Kingdom of Bahrain
amsafar@gmail.com



Ali Al Safar

Owner, Ali Safar for Jewelry and Pearls

He started his career in the jewelry industry in the private sector since the seventies and then entered the work in this field in the public sector. Ali is one of the oldest and most passionate Bahraini gemologists with over 30 years solid experience in the field of gems, gold and Bahraini pearls, enhanced by many courses from specialized international laboratories and universities. Through his vast experience in the gems world, has established, managed and developed the Gem and Pearl Laboratory under Ministry of Industry and Commerce for more than 25 years as the Director of Precious Metals and Gemstones and managed to equip it with the latest technology to become one of the best laboratories in the region. Currently the owner and founder of family business "Ali Safar for Jewelry and Pearls" mainly aiming to preserve and revive the traditional pearl and Bahraini gold crafts by re-introducing the Jewellery in a traditional, semi traditional and modern pieces. He is also one of the researchers and contributing writers of "Treasures of Bahrain Book" published 1998

Bahrain's heritage has been steeped in the beautiful art of pearling for centuries, with the ancient city of Muharraq being considered the capital of pearls in the Arabian Gulf. 'The Bahraini Pearl Trade' explores the ability of the Bahraini pearl trade to greatly contribute to the economy and international industry. The unique characteristics of the Bahraini pearl make it an excellent investment for jewellery and fashion brands across the world in this day and age. This is largely due to Bahrain's efforts to protect the integrity of the natural Bahraini pearl with the century-old regulation which prevents the circulation of cultured pearls within Bahrain. As the only country in the world following such a regulation, buyers from around the world can be assured of the authenticity of the pearls purchased in Bahrain. The Kingdom of Bahrain has steadily produced widely acclaimed pearls known for their stunning lustre, colour and size. Trade practices, selling and age-old manufacturing techniques which have stood the test of time will be highlighted. While pearls are generally considered beautiful and a symbol of elegance, they are further classified according to size using special sieves known as Tus. One of the finest pearls in Bahrain and the region is Jiwan, followed by Yucca and finally Al-Sehtit. Due to the difference in size, shape, colour and lustre, to this date each pearl has its own price as they are all fairly unique. Some pearl necklaces take years to be crafted while jewellers systematically collect the required number of pearls in equal sizes. To date Bahraini merchants, with a keen eye for quality, practice in the Bahraini pearl trade. These individuals and specialised jewellery and gemstone facilities have earned Bahrain a significant reputation in the region's jewellery industry. The Kingdom also provides local and international traders access to world-class services within the region through the specialised laboratories within the Ministry of Industry and Commerce and nowadays the specialised organisation, DANAT, which provides pearl and gemstone testing, authentication and verification services in the region. Given that the Bahraini pearl once fuelled the Kingdom's economy, the presentation will also explore lucrative opportunities for local and international traders which could lead to Bahrain regaining its position as a significant contributor to the international natural pearl industry. Before the discovery of oil and the challenges presented by cultured pearls internationally, the extraction and trade of Bahraini pearls led to the creation of specialised job opportunities for pearl merchants, divers, shipyards, shipbuilders, timber merchants, and suppliers in Bahrain. The revival of the vibrant pearl trade, through trade and investment in the Kingdom, has the potential to recreate this string of specialised job opportunities. The significance of pearls, their symbolism and how the natural gems were once considered status symbols is undeniable. Natural pearls have the potential to regain their status in the pearl and jewellery industry, and once again be valued and sought-after on a global scale.



Dr. Hashim Al Sayed

Associate Professor of Biological Oceanography, University of Bahrain

In 1988 he obtained a Ph.D. (Biological Oceanography) and MSc. (1981) Southampton University, U.K. B.Sc (Oceanography) Alexandria University, Egypt 1978. He was appointed as Dean of two colleges, College of Science (2011-2017) and College of Health Sciences (2016-2017). In 1996-2000, he became the Chairman at Department of Biology. He gained important managerial and communication skills and played a central role in promoting teaching and research in the College of Science and Biology Dept. He was promoted from Assistant to Associate Professor of Biological Oceanography in 1997. In 1988-1989, he joined Bahrain Centre for Studies and Research attached to the Pearl Oyster Project. Earlier (1982-1983) he worked at Directorate of Fisheries doing ecological research. He was awarded the Crown Prince Award for Scientific Research for a group of published papers in refereed periodical on Biology of Pearl Oyster in Bahrain in December 1994. Dr. Hashim research interests is in biology of pearl oyster, intertidal ecology and marine pollution. He published 23 papers in refereed journals in the fields of spawning, growth rate, morphometry and spat collection, in addition to, organic & inorganic pollutants in pearl oyster. He worked as an expert in reproductive biology of pearl and rock oysters (Mussel Watch Program) for ROPME.

Some Biological and Pollution Aspects of Pearl Oyster *Pinctada radiata* in Bahrain

Dr. Hashim Al Sayed

Dept.of Biology, College of Science, University of Bahrain, P.O.Box 32038, Sakhir Campus,
Kingdom of Bahrain
halsayed@uob.edu.bh

Bahrain is among few places in the world where natural pearl oyster occur in large quantities. The Bahraini pearls are known to be of good quality and demand high prices. The present account summarizes results of several baseline studies carried out recently on different biological and pollutional aspects of the pearl oyster *Pinctada radiata* in Bahrain. Natural populations of pearl oyster around Bahrain showed considerable spatial differences in their sizes in relation to salinity. Large- sized oyster predominate at east coast namely Ras Hayan(75-80mm) whereas small-sized individuals (35-40 mm) characterized oyster population at Yasooof island on west coast of Bahrain. Intermediate sizes (65-66 mm) were found at Al-Saiyeh island in northern part of the country. Indirect gonad maturation was studied using gamete (oocytes) counts. The results indicated that *P.radiata* does not release all of its eggs (oocytes) in one time, but spawn frequently over extended period with peak spawning around mid summer months. In Bahrain seafood has been a stable food item and a good source of protein. In this regard proximate composition and nutritive value of pearly oyster have been investigated. Results indicated that oyster is fairly high in protein (10.36-13.93%) but low in fat (0.73-1.11%).

Pearl oyster spat settlement under different environmental conditions at several locations around Bahrain, was studied. Spat collectors were made using readily available and cheap materials. Results indicated that although settlements took place over long period, intense settlement was recorded during August, indicating that spawning commenced toward end of July and August. Empty oyster shells attracted maximum settlement (80 spats per oyster shell).

Oysters feed by filtering large volume of seawater to trap food particles. In doing so, the animals concentrate pathogenic and non-pathogenic microorganisms in their bodies. Seasonal heterotrophic aerobic bacteria in Bahrain pelagic and near shore waters and oysters have been investigated. Results indicated that *Vibrio cholerae* was more prominent than *V. parahaemolyticus*. *Faecal streptococci* were detected mainly in waters of both sites during September and October.

Levels of chemical contamination in pearl oyster and seawater in near shore and offshore stations were studied in order to identify sources of pollution to Bahrain marine environment and its biota. Lead (Pb), Iron (Fe), Zinc (Zn) and Cadmium (Cd) were highest at offshore station, whereas Nickel (Ni) was higher in near shore station. However no differences in concentration of Copper (Cu) and Manganese (Mn) was observed between two stations. Pb and Cd however have exceeded WHO limits. Pearl oysters living at different stations were selected in order to determine chlorinated hydrocarbons which were found to be below detection limit and below allowable limits.



Noura Al Sayeh

Head of Architectural Affairs, Bahrain Authority for Culture and Antiquities

Noura Al Sayeh-Holtrop is an architect and curator working at the Bahrain Authority for Culture and Antiquities (BACA) as Head of Architectural Affairs, where she is responsible for overseeing the planning and implementation of cultural institutions, museums and exhibitions. She holds a Master's Degree in Architecture from the École Polytechnique Fédérale de Lausanne. Noura was the co-curator of 'Reclaim', Bahrain's first participation at the Venice Architecture Biennale in 2010 that was awarded a Golden Lion, and the Deputy Commissioner General of Bahrain's Pavilion at the Expo Milan 2015, awarded a Silver Medal for Best Architecture and Landscape. Since 2015, she heads the 'Pearling, Testimony of an Island Economy', which received the Aga Khan Award for Architecture for the 2019 cycle as part of the Muharraq Revitalization project.

Project Description

In the heart of Muharraq, Bahrain's former capital, the UNESCO World heritage site "Pearling, Testimony of an Island Economy" relates the unique legacy of Bahrain's pearling era, through the architecture and the urban heritage of the old city of Muharraq as well as three pearl producing oyster beds in the northern territorial waters of Bahrain. Taken together, the fifteen individual sites reflect the final expression and last remaining – and thus outstanding – example of a cultural tradition that dominated the Arabian Gulf from prehistory to the early 20th century. The project also includes 17 public squares and 4 multistory parking structures that respond to the contemporary needs of the city.

The History of the Pearling Trail

Noura Al Sayeh

Jamsheer House, House 763, Road 936, Block 209, Muharraq, Kingdom of Bahrain
nouralsayeh@gmail.com

For millennia, pearling and its associated trades shaped the economy and culture of Bahrain's island society. As a centre for pearling, Bahrain was the regional economic hub where pearl divers and other crew from across the Gulf arrived to test their fate on board the dhows. The outcome of the pearling season provided the livelihood of many local residents and their trades, amongst them: merchants, creditors, boat owners and makers, captains, divers, haulers, and sail-makers. Pearls collected in Bahrain were sent to Europe and India where they were refined and traded to larger markets.

Even though the pearl collection industry heavily declined as a result of irreversible economic change in the 20th century, many of its features and practices survive, and it remains the major factor in Bahraini cultural identity. The surviving traces of Bahrain's tangible and intangible pearling heritage are rare testaments to the Gulf's trans-regional, socio-economic connections before the discovery of oil.

"Pearling, Testimony of an Island Economy" is UNESCO World Heritage serial site consisting of 15 property components: three vast oyster beds located in the northern territorial waters of Bahrain, one seashore site at the southern tip of Bahrain's Muharraq Island, and nine clusters of historic buildings consisting of seventeen architectural structures embedded in the urban fabric of Muharraq city. Taken together, the fifteen individual sites reflect the final expression and last remaining – and thus outstanding – example of a cultural tradition that dominated the Arabian Gulf from prehistory to the early 20th century.

Old Muharraq settlement was Bahrain's capital from 1810 to 1923, the peak years of the pearling economy, and is today the predominate city of Bahrain's second largest island. For centuries, Muharraq was the Arabian Gulf's pearling capital: it was the Gulf's most active and prosperous pearling city; the largest number of pearl divers lived here; virtually everybody was involved directly in pearling activities or its supply industries; and Muharraq boasted the largest fleet of pearling vessels.

Muharraq can be distinguished from many other Arabian Gulf settlements in that, by the last decades of the pearling economy, the city was built largely of coral stone. In contrast, around the turn of the twentieth century several of the Gulf's smaller pearling centres, such as Dubai, were almost entirely barasti settlements (temporary houses made of palm material). This stone construction ensured the survival of significant elements in Muharraq that now constitute a unique testimony of the pearling societies not only of Bahrain but of the Arabian Gulf region.

Although Muharraq's pearling economy subsided in the 1930s, the grand narrative it produced remains the most significant source of Bahraini cultural identity. More than a mere "story", this grand narrative is a comprehensive, shared memory and a thorough explanation of historical experience and traditional knowledge that provides meaning to contemporary identity throughout the Arabian Gulf.



Kenneth Scarratt
Managing Partner, ICA|GemLab Bangkok

He is currently the Managing Partner for ICA|GemLab located in Bangkok, Thailand. He was formally CEO of the Bahrain Institute for Pearls & Gemstones (DANAT), Managing Director for SE Asia for the Gemological Institute of America, Laboratory Director for the AGTA (American Gem Trade Association) Gemological Testing Center in New York City, Director of AIGS (Asian Institute of Gemological Sciences) in Bangkok, and Chief Executive and Laboratory Director GAGTL (Gemmological Association & Gem Testing Laboratory of Great Britain) in London. Has published papers extensively in such journals as The Journal of Gemmology (UK), Gems and Gemology (USA) and many others. Has co-authored the books, The Crown Jewels, and, The Pearl & the Dragon. He has delivered lectures to gemologists and traders in many countries including: Australia, Bahrain, Brazil, Canada, China, Colombia, Dubai, England, France, Germany, Hong Kong, India, Israel, Italy, Japan, Singapore, Thailand, Sri Lanka, and the USA (several States). In addition to his work with diamond, ruby and sapphire, he has studied and visited pearl producing areas in several countries including: Australia, Bahrain, China, Indonesia, Japan, Scotland, Thailand, UAE, and Vietnam and is a leading authority on natural pearls, both salt and freshwater.

The origins and modern trade usage of the term Keshi (“ケシ” – poppy seed) when used in connection with pearls or cultured pearls

Kenneth Scarratt

ICA GemLab, Bangkok, Thailand,
ken.scarratt@gmail.com

Natural pearls of \approx or $<2\text{mm}$ in size are traditionally known internationally as “seed pearls” or in Japan by the quaint term “ケシ” which relates to poppy seeds, and translates into English as “Keshi”. Jewellery made from seed pearls were greatly appreciated in the USA and Europe and were popular during the Victorian era (1837-1901) but more specifically they were popular from 1840 - 1860 when seed pearls were copiously set into Parures (comprising necklaces, bracelets, earrings and brooches).

However, once the culturing process had become a commercial proposition in Japan, and it was discovered that pearls of “seed pearl sizes” accidentally formed both within (the Akoya oyster) and close to the gonad (Figure 1), and that the external appearance were similar to the natural Keshi, of a previous era, so these accidentally cultured pearls were also termed simply as “Keshi” as at the time there appeared to be no way to separate these from the original natural seed or Keshi pearls.

Hence the definition of “keshi” in the CIBJO pearl book, that was developed under the guidance of the Japanese pearling industry can be confusing in that it has been used for both natural and cultured pearls. Further complicating the understanding is that the term has been adopted in modern times for larger cultured pearls that are produced either in or just outside the gonad, i.e., in modern terminology the term keshi is now associated with cultured pearls of all sizes.

A further complication to the understanding is the assumption in some quarters that pearls formed in naturally formed pearl sacs and away from the area of the gonad but in pearl oysters that are hatchery grown or have been operated upon on a farm, are also cultured keshi.

This presentation seeks to provided a clearer understanding of the various scinerios and hence the nomenclature useage.



Figure 1: Original keshi cultured pearl sizes were “seed pearl sizes” and could be found close to the gonad; they occurred as a consequence of the culturing operation in the Akoya pearl oyster (right – multitude of seed sized keshi cultured pearls in an Akoya pearl oyster partially in the gonad).

Pearl and Pearling History

Elisabeth Strack

Gemmologisches Institut Hamburg, Poststr. 33, 20354 Hamburg,
info@strack-gih.de

All of today's natural pearl sources have been known for centuries, some of them from ancient times onwards. New developments refer rather to cultured pearls – with the exception of those rare exotic pearls that come from gastropods and molluscs other than the conventional bivalves and that have recently attracted market attention (as for example Conch pearls, Melo pearls, Abalone pearls, etc.). Those pearl localities that were already known in antiquity, all lie, from a European point of view, in the east or the Orient, consequently the pearls became known as „oriental pearls“. The classical finding places all lie in the area of the Indian Ocean, the most prominent ones are the Arabian/Persian Gulf, the Red Sea and the Strait of Manaar between Sri Lanka and India. Most oriental pearls originate from the small *Pinctada radiata* bivalve but the larger *Pinctada margaritifera* also occurs in the Gulf and the Red Sea.

Interestingly, today's cultured pearl industry started in Japan where Kokichi Mikimoto was, from 1916 onwards, successful in producing round white pearls by employing the bead method. Later named Akoya cultured pearls (the Japanese name for the local *Pinctada martensii* is Akoya gai), the pearls were to change the market.

In the 15th and 16th centuries, new sea routes, both to the west and to the east, led to the discovery of new finding places. In 1498, Christopher Columbus came across pearls on the coast of Venezuela and American pearls were soon to enter the European market as „occidental“ pearls. Coming also from *Pinctada radiata*, they achieved a certain fame but pearl banks no longer exist. On the Pacific American coast, larger, darker and more colourful pearls originated from the species *Pinctada mazatlanica* and *Pteria sterna*, later often termed La Paz pearls. *Pteria sterna* is today used for pearl culture in the Sea of Cortez in Mexico.

In the east, new trading places developed in the Indian and the Pacific Ocean from where large white and golden pearls from *Pinctada maxima* and black pearls from *Pinctada margaritifera* in French Polynesia were brought back to Europe. Around 1900, the mother-of-pearl industry began to search for the large shells of *Pinctada maxima* and fishing fleets set out for an area covering Australia, Indonesia, the Philippines and Myanmar. It was through the structures established by those fleets that cultured pearl production, by employing Mikimoto's method, started in Burma, Indonesia and the Philippines and from the late 1950s onwards in Australia, leading to a new cultured pearl industry that today produces the large white and golden South Sea cultured pearls. From the 1970s onwards, black cultured pearls from French Polynesia, so-called Tahitian cultured pearls, followed.

The bulk of cultured pearl production is, since the 1970s, made up of freshwater cultured pearls from China (after an initial small production at Lake Biwa and presently at Lake Kasumigaura in Japan). A variety of methods, with and without inserted mother-of-pearl beads, is used to produce a huge variety of shapes, sizes and colours, going from cheap mass production to exquisite individual pieces, making mainly use of the local freshwater mussel *Hyriopsis cumingii*.

Today's natural pearl market still includes natural freshwater pearls, mainly from the United States, while European pearls are only available from old stocks as the European pearl mussel *Margaritifera margaritifera* is under protection.



Elisabeth Strack
Founder, Gemmologisches Institut Hamburg

Elisabeth Strack started her gemmological training with Professor Schlossmacher at the Institut für Edelsteinforschung in Idar-Oberstein and completed it with the FGA in England (where she was awarded the Tully Medal in 1967) and the GG at the Gemological Institute of America in 1972. After several years of working with mining companies, jewellers and institutions of the jewellery industry in different countries, she founded in 1976 her own gem-testing laboratory in Hamburg in Germany that was named „Gemmologisches Institut Hamburg“ in 1994. Elisabeth Strack has since made a name for herself as an independent expert, she travels frequently and gives lectures and seminars both in Germany and abroad. In 1982, the first edition of her book on pearls was published, followed in 2001 by a completely revised edition of ca. 700 pages (named „Perlen“ in German) that was translated into English in 2006.



Nicholas Sturman
Identification Manager, GIA Bangkok

Nicholas Sturman has over 25 years of detailed experience in the examination of pearls. He obtained his FGA and DGA qualifications in the UK prior to joining the world renowned Gem Testing Laboratory of Great Britain and continued with 16 years studying pearls in the Kingdom of Bahrain where he served as the gemological advisor to the Bahrain Government's Gem and Pearl Testing Laboratory. Nick specializes in the identification of pearls using the advanced instrumentation available in GIA's Bangkok laboratory where he has worked for the last 11 years. He also oversees GIA's pearl departments in New York, Carlsbad, and Hong Kong. As well as writing contributions to various gemological publications he has also given presentations in Thailand, USA, Singapore, Hong Kong, Japan, The United Kingdom, France, Switzerland and various countries within the Middle East. Nick periodically assists with teaching and educational seminars when required, and has co-authored two books "Kunooz Al-Bahrain" and "Splendour and Science of Pearls". Nick was the joint winner of the 2010 Dr. Edward J. Gubelin Most Valuable Article Award, as voted by Gems & Gemology readers, and is currently a member of Gems and Gemology's editorial review board.

Pearl Laboratory Notes

Nicholas Sturman

Gemological Institute of America, 6th & 10th Floors, U-Chu-Liang Building, 968 Rama IV Road, Silom, Bangrak, Bangkok, Thailand.
nsturman@gia.edu

Today's gemmological laboratories have developed in keeping with the changes in the jewellery industry over the years and as a consequence the investment in technology (Figure 1), level of expertise and introduction of new techniques have all played their part in making the laboratory of the past something that can only be read about in literature. This presentation will note some of these changes and provide an insight into the work that modern laboratories offering a pearl testing service provide for their clientele. Since a lot of the work, past and present, involves the use of X-rays, the testing principles themselves may have not changed a great deal but the instrumentation in which the X-ray source is housed as well as the tubes themselves have developed and this in turn is reflected in other areas of the equipment design.

Long gone are the days where pearl testers developed the film by themselves in a dark room and then waited for the film to dry. Today's gemmologists are able to instantly see high resolution images of the pearl(s) under test in real-time using detectors [1] that, like other equipment, are improving on a fairly frequent basis. Of course all of these developments tend to manifest themselves in equipment that becomes beyond the reach of many smaller gemmological organizations and so pearl testing, especially where the results can be trusted by the trade, tends to be the domain of those laboratories with sufficient resources and/or expertise to be able to offer such a service. Yet, even with all of these advances pearl testing remains challenging at times and although the technology and resources have helped it still falls within the domain of the gemmologist to interpret the data and make a final decision. Some examples will also be included to show how this is not always so easy and illustrate how the human factor comes into play on a number of fronts.

However, the work of gemmological laboratories is not only limited to gemstone identification, they have a wider role to play in the industry and to round of the presentation the different aspects of a gemmological laboratory's work will be covered. This overview will ultimately show how the work undertaken by those organizations that offer a pearl identification service fall into a relatively exclusive group among the many organizations that offer gemmological services globally.



Figure 1. A variety of costly assets, including experienced staff, are required by any pearl testing facility.

References

[1] Karampelas S. Al-Atawi A.T., Al-Alawi A. (2017). Real-time microradiography of pearls: A comparison between detectors. *Gems & Gemology*, Vol. 53, No. 4, pp. 452-456.

دانات
DANAT



معهد البحرين للؤلؤ والأحجار الكريمة
BAHRAIN INSTITUTE FOR PEARLS & GEMSTONES



THE PEARL SYMPOSIUM

1st EDITION - KINGDOM OF BAHRAIN 14 - 15 NOVEMBER 2019