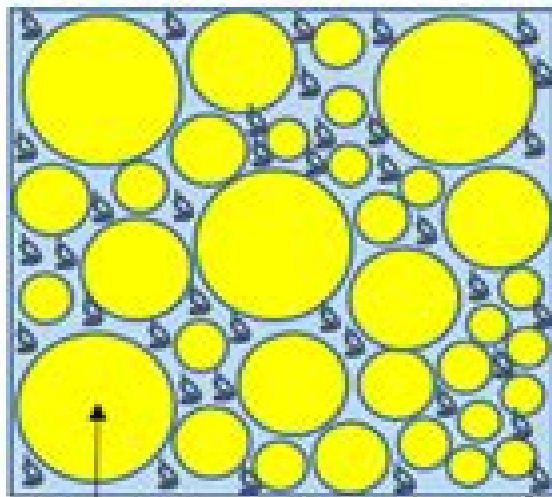


Transglutaminase-Induced Crosslinking → **Elasticity**

Solid Fat Content Increases → **Plasticity & Melting**

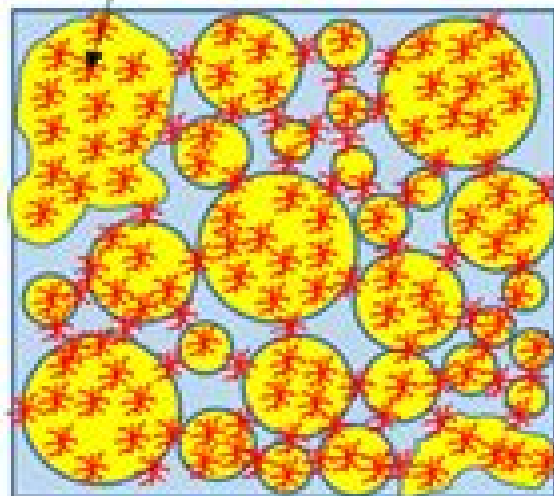


No solid fat, not crosslinked: *packed droplet network*

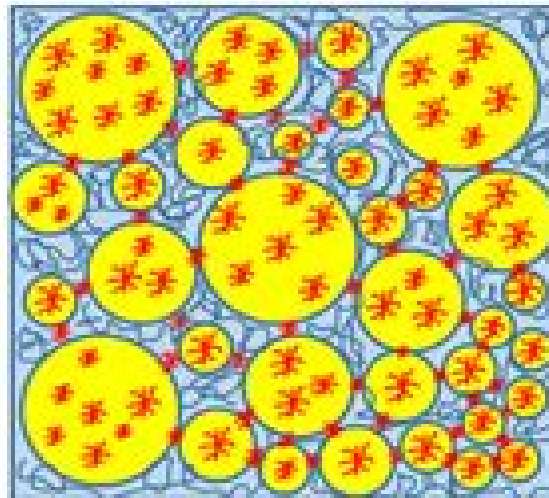
Oil droplets

Proteins

Fat crystals

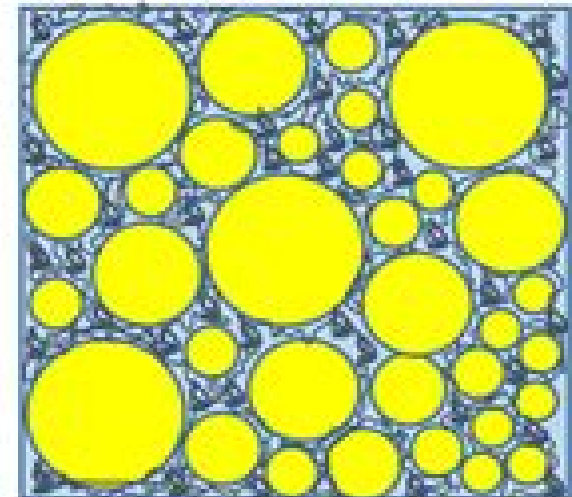


High solid fat content, not crosslinked: *particulate fat crystal network*



No solid fat, crosslinked: *droplet-filled protein network*

Intermediate solid fat content, crosslinked: *mixed protein and particulate fat crystal network*



Fat Crystal Networks Food Science And Technology

Jose Miguel Aguilera, Peter J. Lillford



Fat Crystal Networks Food Science And Technology:

Food Materials Science Jose Miguel Aguilera, Peter J. Lillford, 2007-12-06 Foods are ingested and become part of our body. This book describes the science and procedure behind the materials in foods that impart their desirable properties. The book can serve as a text in a course in food materials science at the senior or graduate level or as a supplemental text in an advanced food technology course. It can also serve as a reference book for professionals in the food industry. **Dairy Fat Products and Functionality** Tuyen Truong, Christelle Lopez, Bhesh Bhandari, Sangeeta Prakash, 2020-05-29 This work highlights a new research area driven by a material science approach to dairy fats and dairy fat rich products where innovative dairy products and ingredients can be tailor made. Cutting edge topics such as tribology of dairy fats and dairy products, manipulation of differentiated sized milk fat globules, milk fat interesterification for infant formula, structuring of lipids in dairy products and production of human milk fat substitutes by including dairy fats are featured in dedicated chapters authored by international scientific experts from across the globe. The text also presents in depth research on proteomic characterization, digestion and the nutritional functionality of milk fat globule membrane. The biosynthesis, chemistry, digestion and nutritional roles of milk lipids, physics of dairy fats, structure and functionality of the milk fat globule membrane, analytical methods, materials science, technology and manufacturing of dairy fat rich products such as butter, dairy fat spreads, dairy creams, cream powders and ghee are also covered in depth. **Dairy Fat Products and Functionality: Fundamental Science and Technology** is a useful reference text for technologists and scientists interested in advancing their fundamental knowledge of dairy fat and dairy products as well as using a materials science and technology approach to guide efforts or widen research opportunities in optimizing the functionality of these products. From their physics and chemistry to their nutritional values and methodologies, this comprehensive and innovative text covers all the necessary information needed to understand the new methods and technologies driving the modern production of milk fat products. **Advances in Biopolymers for Food Science and Technology** Kunal Pal, Preetam Sarkar, Miguel Cerqueira, 2024-05-31 *Advances in Biopolymers for Food Science and Technology* brings together the latest techniques for the preparation of bio based polymeric materials for novel food applications. The book begins by introducing biopolymers and their various polysaccharide and protein sources, addressing biopolymers from marine sources in particular. Food design using biopolymers and their preparation as gels and composites are then discussed in detail. This is followed by in depth chapters guiding the reader through specific applications including fat replacement products, delivery systems, food emulsions, micro and nano encapsulation, nanovehicles, nanostructures, nanofilms, antimicrobial peptides, food coatings, food packaging, smart monitoring, cryoprotection and cultured meat production. Finally, the various challenges regarding sustainability of food packaging are addressed. This is a valuable resource for researchers and advanced students across polymer science, food science, chemistry, packaging, nanotechnology and materials science as well as industrial scientists and R D professionals with an interest in

biopolymers for advanced applications in food products and packaging Covers biopolymers from a range of sources and their preparation as composites gels and coatings Explores applications across food structure design smart packaging systems encapsulation and nutraceuticals Offers case studies and analyzes experimental data on biopolymeric materials for food applications

Understanding and Controlling the Microstructure of Complex Foods D. Julian McClements, 2007-08-30 It is widely accepted that the creation of novel foods or improvement of existing foods largely depends on a strong understanding and awareness of the intricate interrelationship between the nanoscopic microscopic and macroscopic features of foods and their bulk physiochemical properties sensory attributes and healthfulness With its distinguished editor and array of international contributors Understanding and controlling the microstructure of complex foods provides a review of current understanding of significant aspects of food structure and methods for its control Part one focuses on the fundamental structural elements present in foods such as polysaccharides proteins and fats and the forces which hold them together Part two discusses novel analytical techniques which can provide information on the morphology and behaviour of food materials Chapters cover atomic force microscopy image analysis scattering techniques and computer analysis Chapters in part three examine how the principles of structural design can be employed to improve performance and functionality of foods The final part of the book discusses how knowledge of structural and physicochemical properties can be implemented to improve properties of specific foods such as ice cream spreads protein based drinks chocolate and bread dough Understanding and controlling the microstructure of complex foods is an essential reference for industry professionals and scientists concerned with improving the performance of existing food products and inventing novel food products Reviews the current understanding of significant aspects of food structure and methods for its control Focuses on the fundamental structural elements present in foods such as proteins and fats and the forces that hold them together Discusses novel analytical techniques that provide information on the morphology and behaviour of food materials

Crystallization of Lipids Kiyotaka Sato, 2018-04-23 An authoritative reference that contains the most up to date information knowledge approaches and applications of lipid crystals Crystallization of Lipids is a comprehensive resource that offers the most current and emerging knowledge techniques and applications of lipid crystals With contributions from noted experts in the field the text covers the basic research of polymorphic structures molecular interactions nucleation and crystal growth and crystal network formation of lipid crystals which comprise main functional materials employed in food cosmetic and pharmaceutical industry The authors highlight trans fat alternative and saturated fat reduction technology to lipid crystallization These two issues are the most significant challenges in the edible application technology of lipids and a key solution is lipid crystallization The text focuses on the crystallization processes of lipids under various external influences of thermal fluctuation ultrasound irradiation shear emulsification and additives Designed to be practical the book's information can be applied to realistic applications of lipids to foods cosmetic and pharmaceuticals This authoritative and up to date guide Highlights cutting edge

research tools designed to help analyse lipid crystallization with the most current and the conventional techniques Offers a thorough review of the information techniques and applications of lipid crystals Includes contributions from noted experts in the field of lipid crystals Presents cutting edge information on the topics of trans fat alternative and saturated fat reduction technology Written for research and development technologists as well as academics this important resource contains research on lipid crystals which comprise the main functional materials employed in food cosmetic and pharmaceutical industry

Advanced Topics in Crystallization Yitzhak Mastai, 2015-05-06 In nearly all process industries crystallization is used at some stage as a method of production purification or recovery of solid materials In recent years a number of new applications have also come to rely on crystallization processes such as the crystallization of nano and amorphous materials The articles in this book have been contributed by some of the most respected researchers in this area and cover the frontier areas of research and developments in crystallization processes Divided into three sections this book provides the latest research developments in many aspects of crystallization including the crystallization of biological macromolecules and pharmaceutical compounds the crystallization of nanomaterials and the crystallization of amorphous and glassy materials This book is of interest to both fundamental research and practicing scientists and will prove invaluable to all chemical engineers and industrial chemists in process industries as well as crystallization workers and students in industry and academia

Crystal Growth Vadim Glebovsky, 2019-11-06 In this book a variety of topics related to crystal growth is extensively discussed The topics encompass the physics of growing single crystals of different functional materials single crystalline thin films and even the features of crystallization of biofats and oils It is intended to provide information on advancements in technologies for crystal growth to physicists researches as well as engineers working with single crystalline functional materials

Structure of Dairy Products Adnan Y. Tamime, 2008-04-15 *Structure of Dairy Products* SOCIETY OF DAIRY TECHNOLOGY SERIES Edited by A Y Tamime The Society of Dairy Technology SDT has joined with Blackwell Publishing to produce a series of technical dairy related handbooks providing an invaluable resource for all those involved in the dairy industry from practitioners to technologists working in both traditional and modern large scale dairy operations The previous 30 years have witnessed great interest in the microstructure of dairy products which has a vital bearing on e g texture sensory qualities shelf life and packaging requirements of dairy foods During the same period new techniques have been developed to visualise clearly the properties of these products Hence scanning electron microscopy SEM and transmission electron microscopy TEM have been used as complimentary methods in quality appraisal of dairy products and are used for product development and in trouble shooting wherever faults arise during manufacturing *Structure of Dairy Products* an excellent new addition to the increasingly well known and respected SDT series offers the reader information of importance in product development and quality control internationally known contributing authors and book editor thorough coverage of all major aspects of the subject core commercially useful knowledge for the dairy industry Edited by Adnan

Tamime with contributions from international authors this book is an essential purchase for dairy scientists and technologists food scientists and technologists food chemists physicists rheologists and microscopists Libraries in all universities and research establishments teaching and researching in these areas should have copies of this important work on their shelves

Food Emulsions David Julian McClements, 2015-08-21 Continuing the mission of the first two editions Food Emulsions Principles Practices and Techniques Third Edition covers the fundamentals of emulsion science and demonstrates how this knowledge can be applied to control the appearance stability and texture of emulsion based foods Initially developed to fill the need for a single resource co

Microstructure of Dairy Products Mamdouh El-Bakry, Antonio Sanchez, Bhavbhuti M. Mehta, 2018-10-22 Provides the most recent developments in microscopy techniques and types of analysis used to study the microstructure of dairy products This comprehensive and timely text focuses on the microstructure analyses of dairy products as well as on detailed microstructural aspects of them Featuring contributions from a global team of experts it offers great insight into the understanding of different phenomena that relate to the functional and biochemical changes during processing and subsequent storage Structured into two parts Microstructure of Dairy Products begins with an overview of microscopy techniques and software used for microstructural analyses It discusses in detail different types of the following techniques such as light microscopy including bright field polarized and confocal scanning laser microscopy and electron microscopy mainly scanning and transmission electron microscopy The description of these techniques also includes the staining procedures and sample preparation methods developed Emerging microscopy techniques are also covered reflecting the latest advances in this field Part 2 of the book focuses on the microstructure of various dairy foods dividing each into sections related to the microstructure of milk cheeses yogurts powders and fat products ice cream and frozen dairy desserts dairy powders and selected traditional Indian dairy products In addition there is a review of the localization of microorganism within the microstructure of various dairy products The last chapter discusses the challenges and future trends of the microstructure of dairy products Presents complete coverage of the latest developments in dairy product microscopy techniques Details the use of microscopy techniques in structural analysis An essential purchase for companies researchers and other professionals in the dairy sector Microstructure of Dairy Products is an excellent resource for food scientists technologists and chemists and physicists rheologists and microscopists who deal in dairy products

Fat Mimetics for Food Applications Miguel Cerqueira, Lorenzo Castro, 2023-05-11 FAT MIMETICS FOR FOOD APPLICATIONS Detailed resource providing insight into the understanding of fat mimetics and their use for the development of food products Fat Mimetics for Food Applications explores strategies for the development of fat mimetics for food applications including meat dairy spreads and baked products covering all the physical strategies and presenting the main characterization techniques for the study of fat mimetics behaviour The text further provides insight into the understanding of fat mimetics in food structure and how it affects food products Fat Mimetics for Food Applications is organized into five sections The first

section provides a historical overview and thermodynamic perspective of the structure properties relationship in fat mimetics Section II is devoted to the main materials used for the development of fat mimetics and the structures that result from different methodologies and approaches Section III overviews the methodologies used for the characterization of the developed replacers Section IV contains examples of what has been done in the use of fat mimetics in food Section V focuses on a future perspective along with real cases of projects within the industry and a commercial perspective of some examples Topics covered in Fat Mimetics for Food Applications include Role of lipids in foods and human nutrition the current status of fats in the food industry and food trends as they pertain to fat mimetics Materials for the production of fat mimetics such as natural waxes sterols lecithin mono and di glycerides fatty alcohols and fatty acids polysaccharides and proteins Rheological and texture properties sensorial aspects of fat mimetics and advanced characterization strategies such as small angle X ray scattering and small angle neutron scattering Fat mimetics nutritional and functional properties along with examples of using in vitro gastrointestinal digestion system to unravel the lipids fat during digestion Examples of the application of fat mimetics in different food products such as meat dairy margarine and fat spreads and baked products Fat Mimetics for Food Applications targets researchers academics and food industry professionals to boost their capability to integrate different science and technology as well as engineering and materials aspects of fat mimetics for food development

Nanoemulsions in Food Technology Javed Ahmad, Leo M.L. Nollet, 2021-10-18 As of late greater efforts are being made in the use of nanoemulsion techniques to encapsulate protect and deliver functional compounds for food applications given their advantages over conventional emulsification techniques In addition delivery systems of nano scale dimensions use low energy emulsification methods and exclude the need of any solvent heat or sophisticated instruments in their production Divided into three sections Nanoemulsions in Food Technology Development Characterization and Applications will provide in depth information and comprehensive discussion over technologies physical and nanostructural characterization as well as applicability of the nanoemulsion technique in food sciences It describes the techniques involved in nanoemulsion characterization mainly dealing with interfacial and nanostructural characterization of nanoemulsions different physical characterization techniques as well as various imaging and separation techniques involved in its characterization Key Features Provides a detailed discussion about the technology of nanoemulsion Explains how nanoemulsion technique is helpful in using essential oils of different biological sources Presents methods of preparation and recent advancements in manufacturing along with stability perspectives of this technique Discusses recent advancements in manufacturing and reviews the stability perspectives of nanoemulsion techniques This book contains in depth information on a technology overview physical and nanostructural characterization as well as applicability of the nanoemulsion technique in food sciences It is a concise body of information that is beneficial to researchers industries and students alike The contributing authors are drawn from a rich blend of experts in various areas of scientific field exploring nanoemulsion techniques for wider

applications Also available in the Food Analysis and Properties Series Sequencing Technologies in Microbial Food Safety and Quality edited by Devarajan Thangardurai Leo M L Nollet Saher Islam and Jeyabalan Sangeetha ISBN 9780367351182 Chiral Organic Pollutants Monitoring and Characterization in Food and the Environment edited by Edmond Sanganyado Basil K Munjanja and Leo M L Nollet ISBN 9780367429232 Analysis of Nanoplastics and Microplastics in Food edited by Leo M L Nollet and Khwaja Salahuddin Siddiqi ISBN 9781138600188

Food Industry Innocenzo Muzzalupo, 2013-01-16 Due to the increase in world population more than seven billion inhabitants the global food industry has the largest number of demanding and knowledgeable consumers This population requires food products that fulfill the high quality standards established by the food industry organizations Food shortages threaten human health and also the disastrous extreme climatic events make food shortages even worse This collection of articles is a timely contribution to issues relating to the food industry The objective of this book is to provide knowledge appropriate for students university researchers and in general for anyone wishing to obtain knowledge of food processing and to improve the food product quality

Fruit and Vegetable Phytochemicals Elhadi M. Yahia, 2017-08-25 Now in two volumes and containing more than seventy chapters the second edition of Fruit and Vegetable Phytochemicals Chemistry Nutritional Value and Stability has been greatly revised and expanded Written by hundreds of experts from across the world the chapters cover diverse aspects of chemistry and biological functions the influence of postharvest technologies analysis methods and important phytochemicals in more than thirty fruits and vegetables Providing readers with a comprehensive and cutting edge description of the metabolism and molecular mechanisms associated with the beneficial effects of phytochemicals for human health this is the perfect resource not only for students and teachers but also researchers physicians and the public in general

Handbook of Food Science, Technology, and Engineering - 4 Volume Set Y. H. Hui, Frank Sherkat, 2005-12-19 Advances in food science technology and engineering are occurring at such a rapid rate that obtaining current detailed information is challenging at best While almost everyone engaged in these disciplines has accumulated a vast variety of data over time an organized comprehensive resource containing this data would be invaluable to have The

Emulsifiers in Food Technology Viggo Norn, 2015-01-20 EMULSIFIERS IN FOOD TECHNOLOGY Emulsifiers are essential components of many industrial food recipes They have the ability to act at the interface between two phases and so can stabilize the desired mix of oil and water in a mayonnaise ice cream or salad dressing They can also stabilize gas liquid mixtures in foams More than that they are increasingly employed in textural and organoleptic modification in shelf life enhancement and as complexing or stabilizing agents for other components such as starch or protein Applications include modifying the rheology of chocolate the strengthening of dough crumb softening and the retardation of staling in bread Emulsifiers in Food Technology second edition introduces emulsifiers to those previously unfamiliar with their functions and provides a state of the art account of their chemistry manufacture application and legal status for more experienced food technologists Each chapter considers one

of the main chemical groups of food emulsifiers Within each group the structures of the emulsifiers are considered together with their modes of action This is followed by a discussion of their production extraction and physical characteristics together with practical examples of their application Appendices cross reference emulsifier types with applications and give E numbers international names synonyms and references to analytical standards and methods Praise for the first edition of Emulsifiers in Food Technology Very informative provides valuable information to people involved in this field International Journal of Food Science Technology A good introduction to the potential of emulsifiers in food technology a useful reference source for scientists technologists and ingredients suppliers Chemistry World A useful guide to the complicated array of emulsifiers presently available and their main functionalities and applications International Dairy Journal

Ingredient Interactions Anilkumar G. Gaonkar, Andrew McPherson, 2016-04-19 Understanding interactions among food ingredients is critical to optimizing their performance and achieving optimal quality in food products The ability to identify study and understand these interactions on a molecular level has greatly increased due to recent advances in instrumentation and machine based computations Leveraging this knowledge

Structure and Properties of Fat Crystal Networks, Second Edition Alejandro G. Marangoni, Leendert H. Wesdorp, 2012-09-25 Lipid science and technology has grown exponentially since the turn of the millennium The replacement of unhealthy fats in the foods we eat and of petroleum based ingredients in the cosmetics we use is a top priority for consumers government and industry alike Particularly for the food industry removing trans fats and reducing saturated fat in foods has produced a major challenge How do we create structure with a minimum amount of structuring material A comprehensive omnibus Structure and Properties of Fat Crystal Networks Second Edition clarifies the complex relationship between triglyceride composition of vegetable oils and fats the physicochemical properties of triglycerides in simple and complex model systems their crystallization and melting behavior Furthermore it dives into the implications of these materials on the functional properties in food systems Replacing ingredients optimizing functionality and improving health necessitate the ability to relate the structural organization present in a material to macroscopic properties Revisiting concepts and approaches used in the study of fat crystal networks the second edition includes new developments particularly intermolecular interactions and thoroughly updated analytical methods Succinct clear and complete this book is designed to help students and early career researchers make the study of fats a more focused less frustrating and less expensive endeavor

Food Engineering Handbook, Two Volume Set Theodoros Varzakas, Constantina Tzia, 2014-12-12 Food Engineering Handbook Two Volume Set provides a stimulating and up to date review of food engineering phenomena It also addresses the basic and applied principles of food engineering methods used in food processing operations around the world Combining theory with a practical hands on approach this set examines the thermophysical properties

Comprehensive Biotechnology, 2011-08-26 The second edition of Comprehensive Biotechnology Six Volume Set continues the tradition of the first inclusive work on this dynamic field with up to date and essential entries

on the principles and practice of biotechnology The integration of the latest relevant science and industry practice with fundamental biotechnology concepts is presented with entries from internationally recognized world leaders in their given fields With two volumes covering basic fundamentals and four volumes of applications from environmental biotechnology and safety to medical biotechnology and healthcare this work serves the needs of newcomers as well as established experts combining the latest relevant science and industry practice in a manageable format It is a multi authored work written by experts and vetted by a prestigious advisory board and group of volume editors who are biotechnology innovators and educators with international influence All six volumes are published at the same time not as a series this is not a conventional encyclopedia but a symbiotic integration of brief articles on established topics and longer chapters on new emerging areas Hyperlinks provide sources of extensive additional related information material authored and edited by world renown experts in all aspects of the broad multidisciplinary field of biotechnology Scope and nature of the work are vetted by a prestigious International Advisory Board including three Nobel laureates Each article carries a glossary and a professional summary of the authors indicating their appropriate credentials An extensive index for the entire publication gives a complete list of the many topics treated in the increasingly expanding field

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web 10 14 feet long and weighing up to 1 400 pounds the tiger shark is one of the sea s large and mighty creatures the name refers to the dark stripes on their sides and backs which is one way they can be distinguished from other shark species

however the stripes typically fade as the animal gets older

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web tiger sharks are known for being aggressive and it s true that they are second only to great whites in numbers of shark attacks on humans but the fact is that people are much bigger threats to tiger sharks than tiger sharks are to people heavy harvesting for fins skin and livers has left tiger sharks classified as near threatened

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web the sand tiger shark carcharias taurus gray nurse shark spotted ragged tooth shark or blue nurse sand tiger is a species of shark that inhabits subtropical and temperate waters worldwide it inhabits the continental shelf from sandy shorelines

hence the name sand tiger shark and submerged reefs to a depth of around 191 m 627

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web the tiger shark galeocerdo cuvier is a species of requiem shark and is the only member of the genus galeocerdo this is one of the largest known species of shark it reaches lengths of up to 5 5 metres 18 feet and weighs over 900 kg 2000 pounds

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web fact file tiger shark galeocerdo cuvier tiger shark galeocerdo cuvier image credit shutterstock a reputation for not being the friendliest of fish species the tiger shark ranks number two after the great white for being responsible for

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web the tiger shark or galeocerdo cuvier is the last remaining member of the galeocerdo genus this apex predator is a requiem shark and it is near threatened because of fishing and finning table of contents characteristics appearance weight length tiger sharks can achieve weights of 850 1 400 pounds and lengths of 10 14 feet

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web oct 30 2023 this was the second unprovoked shark attack of 2023 involving a tiger shark the first came back on april 9th also in oahu and it occurred in just 4 5ft of water

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web the tiger shark is a species of requiem shark that is often referred to as the sea tiger the scientific name for the tiger shark is galeocerdo cuvier and it is part of the family carcharhinidae there are a few different theories as to why this particular species of shark is called the tiger shark

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web the tiger shark is one of the requiem sharks renowned as formidable predators with powerful jaws and razor sharp teeth it is the second largest predatory shark after the great white shark measuring over 5m 16ft in length and weighing 900kg 2 000 lbs

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web sep 15 2023 tiger shark galeocerdo cuvier large potentially dangerous shark of the family carcharhinidae it is noted for its voracity and inveterate scavenging as well as its reputation as a man eater the tiger shark is found worldwide in warm

oceans from the shoreline to the open sea

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web reaching lengths of at least 18 feet 5 5 m and 2000 pounds nearly a metric tonne the tiger shark is the fourth largest shark and second largest predatory shark behind only the great white shark tiger sharks are aggressive predators famous for eating just about anything they find or are able to capture

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web oct 30 2023 just days ago a juvenile tiger shark bit a surfer from spain on the thigh during a session at pua ena point on the north shore more shark sightings around oahu followed like the one below

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web tiger sharks are a large species of predatory shark native to subtropical and tropical coastlines worldwide they are a large species and exceptional individuals can reach 18 ft long and possibly longer this shark s name comes from the dark stripe like pattern on its skin which resembles a tiger s stripes

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web oct 26 2023 the shark teeth are of a similar size and came from tiger sharks galeocerda cuvier that were approximately two metres long both teeth are perforated a complete tooth found at the cave site of

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web nov 24 2020 the tiger shark is the only member of the genus galeocerdo and is a large predatory species tiger sharks are found in many temperate and tropical oceans and are known for their distinctive stripes and spots on their flanks which resemble a tiger s stripes

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web interesting facts tiger sharks on coral reefs tiger sharks are excellent scavengers with the best eyesight among the shark species and an equally keen sense of smell this helps them become great nighttime predators female tiger sharks have anywhere from 10 to 82 embryos and give birth to an average of 30 to 35 pups per litter

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web jun 5 2018 weighing 1300 pounds or more and growing up to 15 feet the tiger shark is the fourth largest shark on earth only whale sharks basking sharks and great whites get bigger on top of

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web tiger sharks have only one recorded natural predator the orca it is considered a near threatened species because of finning and fishing by humans the tiger shark is second only to the great white in recorded fatal attacks on humans but these events are still exceedingly rare

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web what are tiger sharks tiger sharks are named for the dark vertical stripes found mainly on juveniles as these sharks mature the lines begin to fade and almost disappear shark attacks

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web the tiger shark is found in tropical and subtropical waters around the world but mostly inhabit a range between the parallels 45 north and 32 south its presence ranges from the east coast of north america to the east coast of brazil including the gulf of mexico

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web jul 15 2017 26 tiger shark teeth facts a tiger sharks tooth is uniquely shaped like the sail of a boat they are very large and notched with saw like edges 27 their teeth are so strong they can cut through the shell of a sea turtle or a clam 28 if one of their teeth break they simply grow a new one the next day 29