Shellfish

The natural choice for a healthy diet.

A report commissioned by the Shellfish Association of Great Britain

About the SAGB

The Shellfish Association of Great Britain (SAGB) is a science based trade association representing the shellfish industry in the UK.

It works towards the sustainable development of the industry, through lobbying government, by bringing together buyers & sellers and other sea users.

The SAGB also strives to promote the high value that shellfish represents in terms of UK seafood landings and in terms of health benefits.

Shellfish
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Important Note

All the information in this report has been highly condensed and simplified to make it suitable for a wide audience with varying levels of knowledge. It is not intended to provide personal medical advice and you should not rely upon it for this purpose. The information, opinions and advice contained in this report may not be appropriate for, or be relevant to, your personal circumstances. If you are seeking authoritative advice or information about your personal diet you are advised to consult a medical practitioner.

The SAGB and those who have assisted in the production of this report have used all reasonable endeavours to ensure that its content, the data that has been compiled and the methods of calculation and research are consistent with normally accepted standards and practices. Because this report only provides general guidance and relies upon research results from a variety of sources, no warranty can be given that the information contained in it is free from errors or omissions.

This report is based on the fully referenced version of "The Nutritional Benefits of Shellfish", copies are available from the Shellfish Association of Great Britain.

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Shellfish - The natural choice for a healthy diet

Introduction

Seafood has long been recognised as a healthy part of the diet; as brain food and being good for the heart.

What is not generally recognised is that shellfish not only share these health benefits but also have their own unique health giving benefits beyond the oyster's traditional reputation as an aphrodisiac.

Diets that regularly include shellfish have been shown to provide protection from heart disease, some cancers such as breast, colon, and prostate cancers and there is also recent research suggesting protection from dementia.

Omega-3s can only be obtained from the diet and are essential for pregnant mothers and infants where they have been shown to promote neurological and cognitive development; shellfish really are brain food!

The protective effects of omega-3s from cardiovascular heart disease is well documented but what is not commonly known is that a balanced diet rich in shellfish can help reduce cholesterol, lower blood pressure and prevent heart disease.

As you will see in this booklet shellfish such as crabs, mussels and oysters are rich in omega-3s with their health giving benefits.

For people watching their weight, on calorie controlled diets or simply wising to eat healthily, shellfish are a superb low fat source of protein and antioxidants and essential vitamins and minerals; prawns contain 8 times less fat than beef and an astounding 18 times less fat than salmon.

The UK benefits from a vibrant shellfish industry supplying over 20 different and delicious species of shellfish to fishmongers and supermarkets. There really is no excuse not to try something new and eat ourselves healthy. If you need some advice on shellfish preparation and recipe suggestions check out our "how to" videos on www.youtube.com/shellfishgb.

Good news for our taste buds and the nation's health.

Tom Pickerell
Director
Shellfish Association of Great Britain

Macronutrient Contents of Shellfish

> *Shellfish can constitute an important part of a balanced healthy diet*

Proteins, Fats and Oils

Shellfish are high in protein, low in fat (particularly saturated fat) and low in calories.

Shellfish are a rich source of omega-3 fatty acids which are recognised to have a variety of health benefits.

Shellfish are a source of a variety of the essential B-vitamins and vitamin E, and are a rich source of important minerals and trace elements such as selenium, zinc and iodine which are not always found in other foods.

Protein

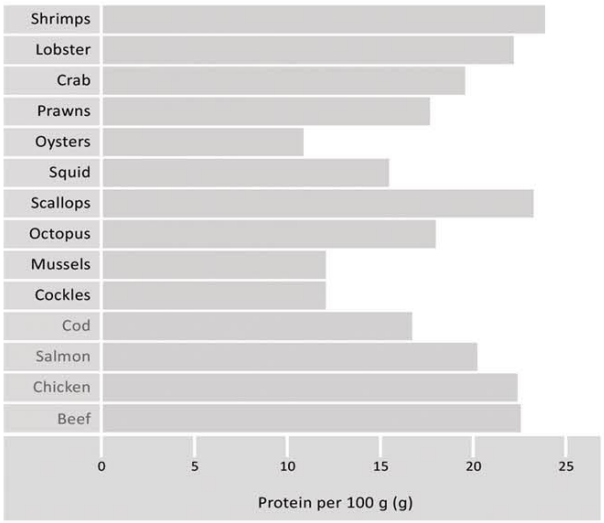
Shellfish are a great low fat source of high quality protein essential for the body to function and for growth and repair.

Protein is made up of amino acid chains, the amount and type of amino acids in a protein varies between dietary sources.

The human body cannot produce certain amino acids through its own metabolism but has to acquire them from the diet; these are known as essential amino acids.

Shellfish protein contains high levels of these essential amino acids giving shellfish protein a high biological value.

Protein content chart



Did you know.... that a 100 g serving of shellfish such as lobster, prawns or scallops can provide up to 50% of the Guideline Daily Amount (GDA) for protein for adult men and women?

Fats and Oils

Shellfish are low in fat but have high levels of omega-3 fatty acids.

The fat content of shellfish varies with the species but in general they all have a very low fat content.

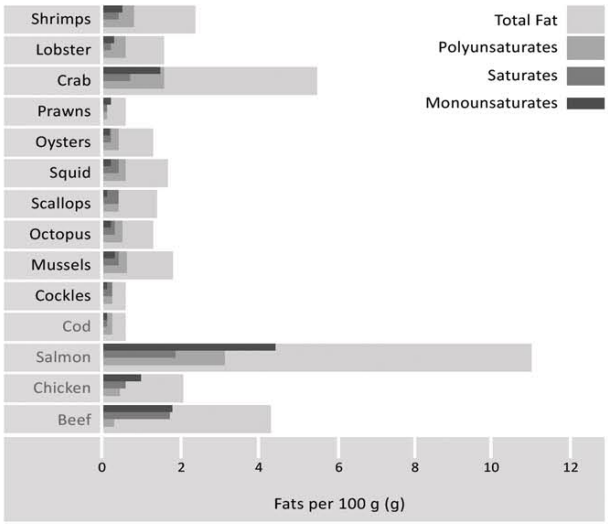
Unlike other protein sources in the diet such as meat and poultry which are high in saturated fat, the fat found in shellfish consists mostly of polyunsaturated fatty acids (PUFA) with a only a small proportion of monounsaturated and saturated fatty acids.

Molluscan shellfish such as cockles, oysters, mussels, and squid have a low fat content of less than 2%.

Crustacean shellfish such as prawns, shrimps, lobsters and crabs have a lipid content of between 0.5% – 5.5%

Fat content table

(per 100 g of common shellfish species compared to other foods)



Compared to a 100 g portion of grilled chicken or grilled sirloin steak containing 6.4% and 12.8% of fat respectively, it is clear that shellfish are a good low fat alternative to poultry and red meat.

Macronutrient Table

per 100g	Shrimps (boiled)	Lobster (boiled)	Crab (boiled)	Prawns (raw)	Oysters (raw)	Squid (raw)	Scallops (steamed)	Octopus (raw)	Mussels (raw)	Cockles (boiled)	Cod*	Salmon*	Chicken*	Beef*
Energy (kcal)	117.0	103.0	128.0	76.0	65.0	81.0	118.0	83.0	74.0	53.0	72.0	180.0	108.0	129.0
GDA (M)	4.7%	4.1%	5.1%	3.0%	2.6%	3.2%	4.7%	3.3%	3.0%	2.1%	2.9%	7.2%	4.3%	5.2%
GDA (F)	5.9%	5.2%	6.4%	3.8%	3.3%	4.1%	5.9%	4.2%	3.7%	2.7%	2.7%	9.0%	5.4%	6.5%
Energy (kj)	493.0	435.0	535.0	321.0	275.0	344.0	501.0	352.0	312.0	226.0	306.0	750.0	457.0	542.0
GDA (M)	4.7%	4.1%	5.1%	3.0%	2.6%	3.2%	4.7%	3.3%	3.0%	2.2%	2.9%	7.2%	4.3%	5.2%
GDA (F)	5.9%	5.2%	6.4%	3.8%	3.3%	4.1%	5.9%	4.2%	3.7%	2.7%	2.7%	9.0%	5.4%	6.5%
Protein (g)	23.8	22.1	19.5	17.6	10.8	15.4	23.2	17.9	12.1	12.0	16.7	20.2	22.3	22.5
GDA (M)	43.3%	40.2%	35.5%	32.0%	19.6%	28.0%	42.2%	32.6%	22.0%	21.8%	30.4%	36.7%	40.6%	40.9%
GDA (F)	52.9%	49.1%	43.3%	39.1%	24.0%	34.2%	51.6%	39.8%	26.9%	26.7%	37.1%	44.9%	49.6%	50.0%
Fat (g)	2.4	1.6	5.5	0.6	1.3	1.7	1.4	1.3	1.8	0.6	0.6	11.0	2.1	4.3
GDA (M)	2.5%	1.7%	5.8%	0.6%	1.4%	1.8%	1.5%	1.4%	1.9%	0.6%	0.6%	11.6%	2.2%	4.5%
GDA (F)	3.4%	2.3%	7.9%	0.9%	1.9%	2.4%	2.0%	1.9%	2.6%	0.9%	0.9%	15.7%	3.0%	6.1%
Polyunsaturates (g)	0.8	0.6	1.6	0.1	0.4	0.6	0.4	0.5	0.6	0.2	0.2	3.1	0.4	0.2
Monounsaturates (g)	0.5	0.3	1.5	0.2	0.2	0.2	0.1	0.2	0.3	0.1	0.1	4.4	0.1	1.8
Saturates (g)	0.4	0.2	0.7	0.1	0.2	0.4	0.4	0.3	0.4	0.2	0.1	1.9	0.6	1.7
GDA (M)	1.3%	0.7%	2.3%	0.3%	0.7%	1.3%	1.3%	1.0%	1.3%	0.7%	0.3%	6.3%	2.0%	5.8%
GDA (F)	2.0%	1.0%	3.5%	0.5%	1.0%	2.0%	2.0%	1.5%	2.0%	1.0%	0.5%	9.5%	3.0%	8.7%
Carbohydrates (g)	Trace	1.1	Trace	0.0	Trace	1.2	3.4	Trace	2.5	Trace	0.0	0.0	0.0	0.0
GDA (M)	-	-	-	-	-	0.4%	1.1%	-	-	-	-	-	-	-
GDA (F)	-	-	-	-	-	0.5%	1.5%	-	-	-	-	-	-	-
Sugars (g)	Trace	Trace	Trace	0.0	Trace	Trace	Trace	Trace	Trace	Trace	0.0	0.0	0.0	0.01

The nutritional composition data used in this table are drawn from the Food Standards Agency's benchmark, Holland B., Brown, J. & Buss, D.H. (1993). Fish and Fish Products. Third supplement to 6th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
**(Beef, average, trimmed lean, raw), *(Chicken, meat only, average, raw), *(Salmon raw), *(Cod frozen raw)*

Shellfish are a rich source of health giving omega-3 fatty acids

Omega-3s

Omega fatty acids are polyunsaturated fatty acid. Omega-3 and 6 are two of the 49 known essential nutrients that have to be obtained from the food we eat.

The human body evolved with a diet almost equal in omega-3 and omega-6 but changes in the way we live has resulted in a large increase in the amounts of omega-6 from plant oils in the western diet. Deaths from coronary heart disease have been linked to increased levels of omega-6 in the western diet. (Based on recent research).

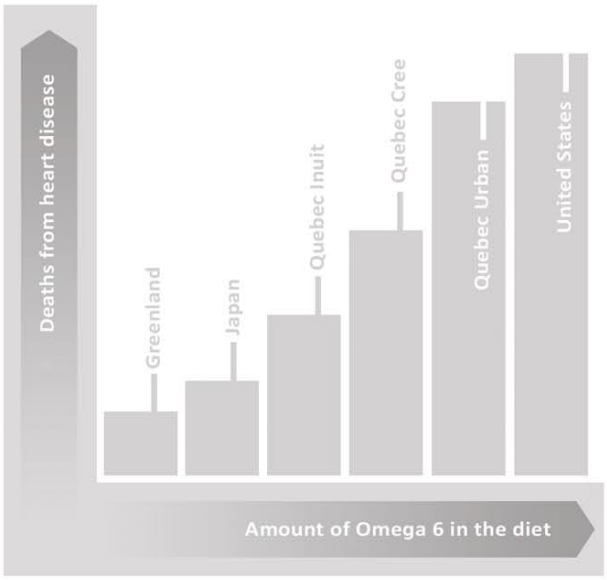
This imbalance has been linked to a variety of other health problems from cancer and neurological disease to inflammatory and autoimmune diseases.

The polyunsaturated fat found in shellfish contain high levels of the nutritionally important long chain omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The human body is very poor at synthesising the EPA and DHA from short-chain omega-3 sources such as Alpha-linolenic acid (ALA) found in flax and hemp oils and so it is essential that these are obtained from dietary sources such as shellfish.

Omega-3s, and particularly DHA and EPA have been shown to provide protection from heart disease, some cancers, reduction of the symptoms of rheumatoid arthritis, and may protect from the onset of Alzheimer's disease. Omega-3s are particularly important for pregnant and breastfeeding women as EPA and DHA play key roles in the neurological, visual and cognitive development of the foetus and infants.

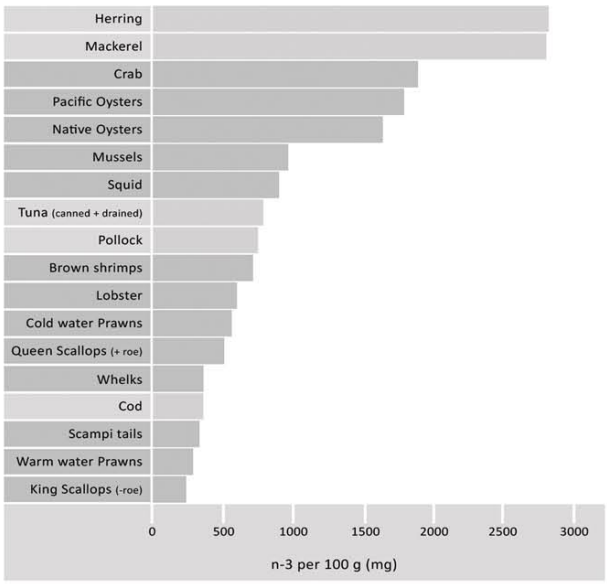
Omega-6 and CHD table

(Correlation between Omega-6 and coronary heart disease)

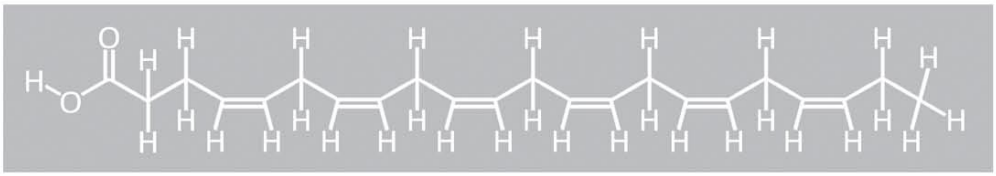


n-3 (omega-3) content table

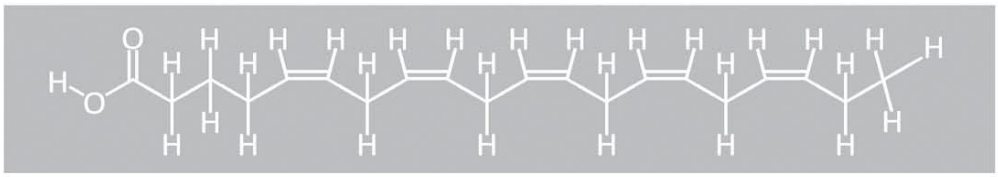
(per 100 g of common shellfish species compared to other foods)



DHA molecular composition



EPA molecular composition



Did you know.... that brown crab, mussels and oysters are especially rich sources of omega-3s and shellfish such as squid, shrimps, cockles and lobsters are also considered to be good sources?

> *Shellfish are good source of vitamins and minerals essential for health.*

Vitamins and Minerals

Shellfish are very good sources of certain vitamins and minerals essential to maintain a healthy body.

Shellfish are rich in the B vitamins and a source of Vitamin E an important antioxidant.

All shellfish are good sources of dietary minerals such as iron, iodine, selenium and zinc.

Minerals such as iodine and selenium, important for the immune system and thyroid function, are present in shellfish more than most other dietary sources. Shellfish are one of the best dietary sources of zinc, necessary for immune system function and in the promotion of wound healing.

B Vitamins

(Thiamin B1, Riboflavin B2, Niacin, B6 and B12)

Shellfish are a source of the B vitamins (Thiamin B1, Riboflavin B2, Niacin, B6) and are a particularly rich in vitamin B12. The B vitamins are water soluble; they are not stored in the human body and therefore have to be obtained from the diet every day.

The B vitamins act as 'co-factors' in different enzyme systems in the body and are necessary for

- the release and utilisation of energy from food
- the metabolism of protein and fat
- cell and blood cell formation and
- the maintenance of a healthy nervous system.

Vitamin E

Shellfish such as prawns, lobster, squid, oysters and mussels are a good source of vitamin E.

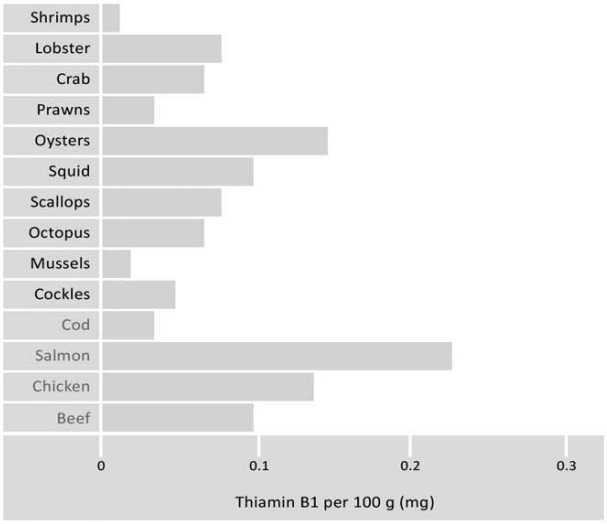
Vitamin E is an important antioxidant and plays a key role in the maintenance of membrane integrity in practically all cells in the human body.

It is thought that the different forms of Vitamin E may have a variety of antioxidant functions and protect against cardiovascular disease and some forms of cancer.

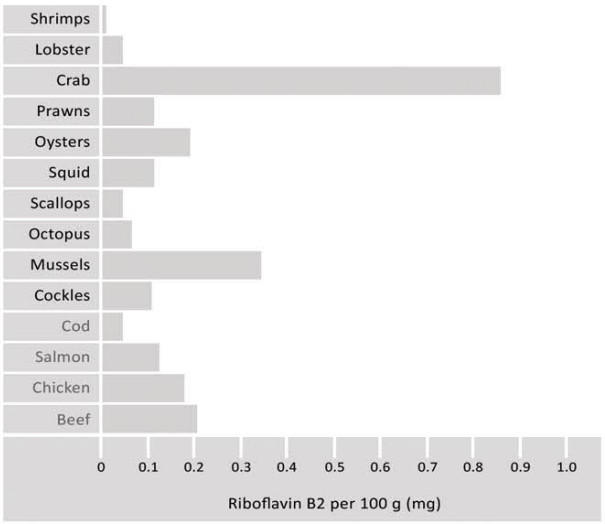
Did you know.... that vitamin E is the name given to a group of eight fat-soluble compounds produced by marine algae but stored in shellfish from their diet?

Vitamin Content Charts

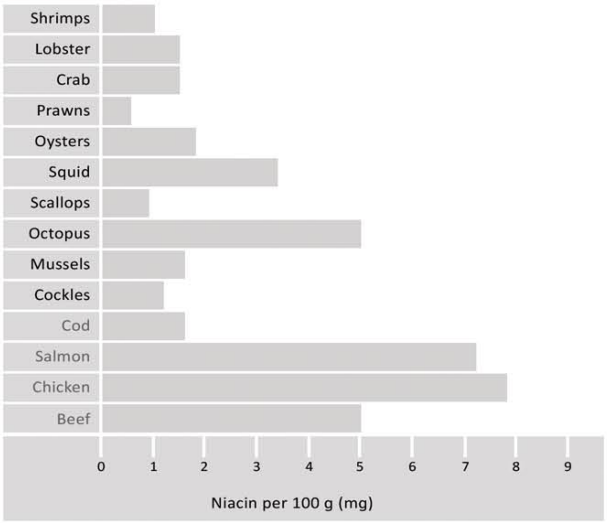
Thiamin



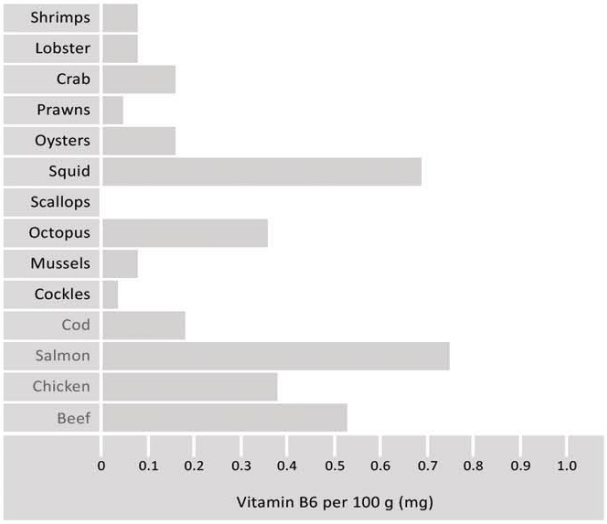
Riboflavin



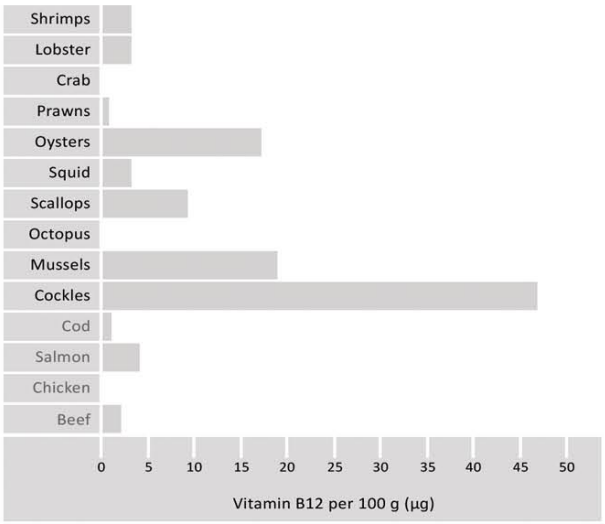
Niacin



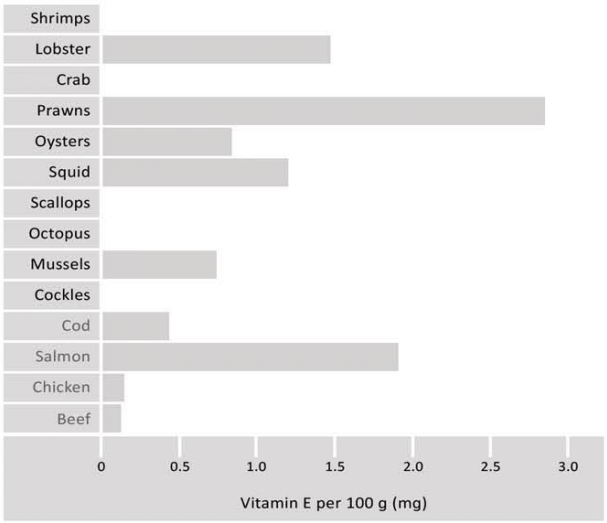
Vitamin B6



Vitamin B12



Vitamin E



All shellfish are a good source of iodine and selenium.

Iodine and Selenium

Shellfish such as cockles, mussels, oysters, lobsters and shrimps are a very good source of iodine.

Iodine

Iodine is a naturally occurring element present in seawater and is a key constituent of the thyroid hormones thyroxine and tridothyronine which are involved in the maintenance of metabolic rate, cellular metabolism and the connective tissue. The thyroid hormones are also necessary during the development of the nervous system in the foetus and infants.

Selenium

Selenium is a naturally occurring element also present in soils and rocks. Shellfish such as crabs, octopus, squid, mussels and scallops are a particularly good source of selenium. Selenium plays an important role in the function of the immune system, in thyroid hormone metabolism and synthesis and in reproduction.
Selenium also plays a key role in the human body's antioxidant defence system, preventing damage to cells and tissues.

Zinc

All shellfish are sources of zinc but oysters are a famously good source, zinc being reputed to be the cause of their aphrodisiac properties. Zinc is a naturally occurring element found in all plant and animal tissues and in seawater. Zinc is a key constituent or cofactor in over two hundred key enzymes in the body. Zinc has an important role in the production and stabilisation of genetic material and is vital for cell division and the synthesis and metabolism of carbohydrates, lipids and proteins.

Zinc also promotes wound healing while the aphrodisiacal properties of oysters are attributed to their high zinc content (zinc is used in the production of testosterone and is also found in sperm).

Copper

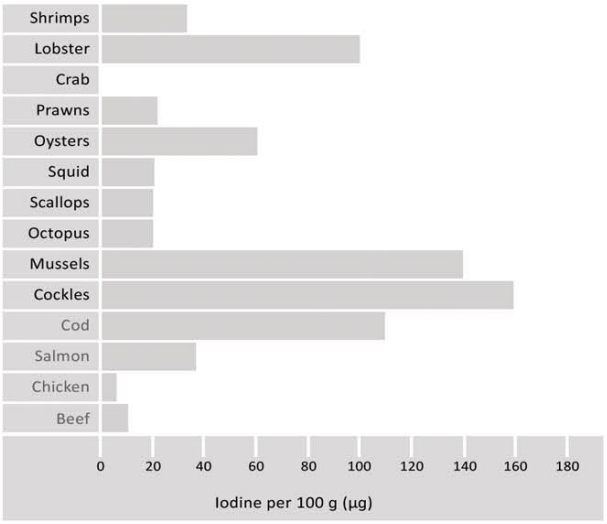
All shellfish are a good source of copper which is a common element in seawater. Shellfish such as oysters, crabs, lobsters, shrimps, octopus, cockles and mussels are a particularly good source of copper. Copper is a naturally occurring element present in the form of mineral salts and organic compounds in seawater. Copper has a wide variety of roles in the human body including for the function of a number of enzymes which are involved in cellular metabolism and respiration, and antioxidant defence. Copper is important for infant growth, immune system function, bone strength and health, red and white blood cell production, iron transport, cholesterol and glucose metabolism, heart function and brain development.

Iron

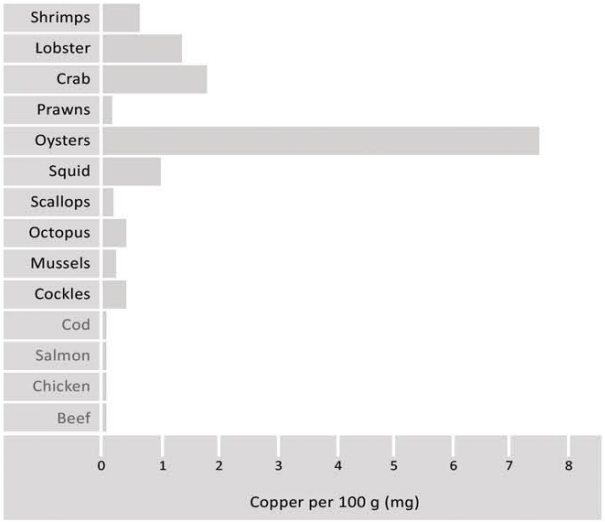
All shellfish are sources of iron but cockles are a particularly good source Iron is a naturally occurring element found widely in nature and many plant and animal tissues. Iron is a key constituent of important protein molecules such as haemoglobin and myoglobin, which are responsible for oxygen transport in the blood, and cytochromes which are involved in energy production in the cells of the body.

Mineral Content Charts

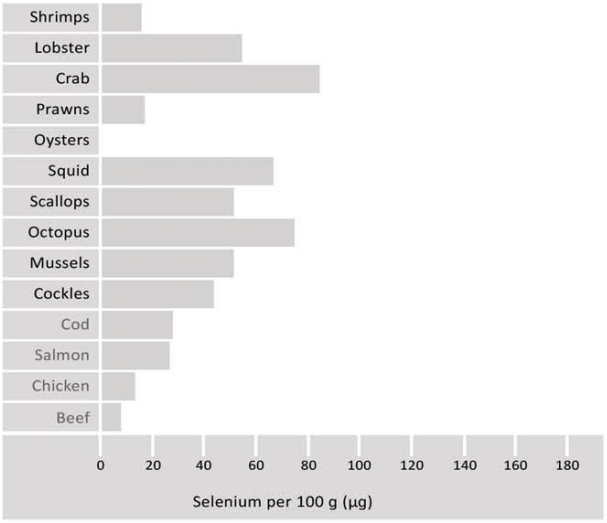
Iodine



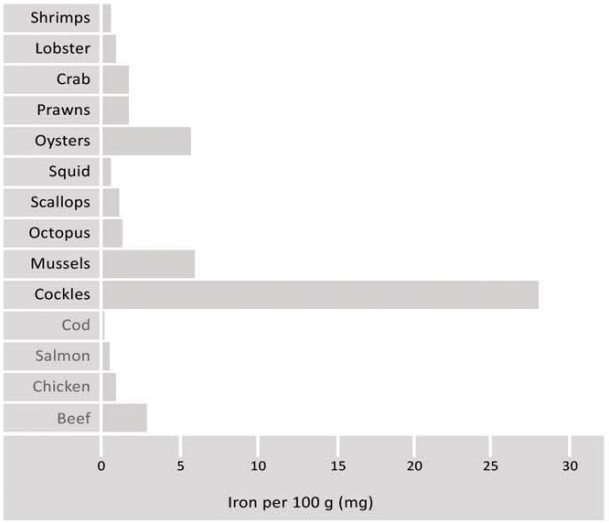
Copper



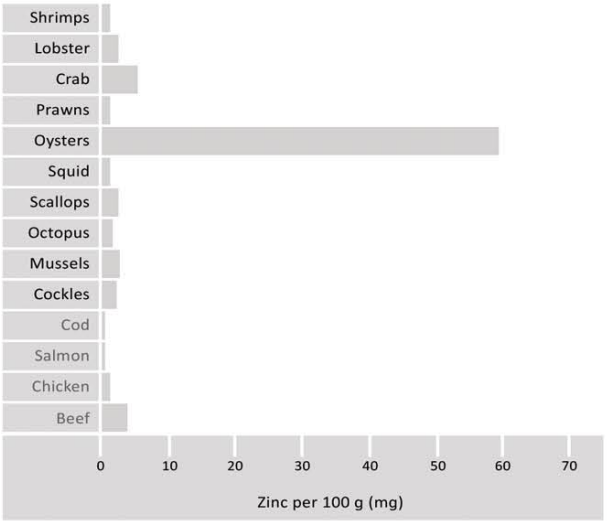
Selenium



Iron



Zinc



Micronutrient Table - Vitamins

per 100g	Shrimps (boiled)	Lobster (boiled)	Crab (boiled)	Prawns (raw)	Oysters (raw)	Squid (raw)	Scallops (steamed)	Octopus (raw)	Mussels (raw)	Cockles (boiled)	Cod*	Salmon*	Chicken*	Beef*
Vitamin A (ug) (Retinol)	0.0	Trace	Trace	Trace	75.0	15.0	Trace	5.0	0.0	40.0	2.0	13.0	11.0	Trace
RDA (M)	-	-	-	-	10.7%	2.1%	-	0.7%	-	5.7%	0.3%	1.9%	1.6%	-
RDA (F)	-	-	-	-	12.5%	2.5%	-	0.8%	-	6.7%	0.3%	2.8%	1.8%	-
Vitamin C (mg)	Trace	Trace	Trace	Trace	Trace	0.0	Trace	0.0	Trace	Trace	Trace	Trace	0.0	0.0
Vitamin D (ug)	Trace	Trace	Trace	Trace	1.0	Trace	Trace	Trace	Trace	Trace	Trace	5.9	0.1	0.5
RDA (M)	-	-	-	-	20.0%	-	-	-	-	-	-	118.0%	2.0%	10.0%
RDA (F)	-	-	-	-	20.0%	-	-	-	-	-	-	118.0%	2.0%	10.0%
Vitamin E (mg)	0.0	1.5	0.0	2.9	0.9	1.2	0.0	0.0	0.7	0.0	0.4	1.9	0.2	0.1
RDA (M)	-	36.8%	-	71.3%	21.3%	30.0%	-	-	18.5%	-	11.0%	47.8%	3.8%	3.3%
RDA (F)	-	49.0%	-	95.0%	28.3%	40.0%	-	-	24.7%	-	14.7%	63.7%	5.0%	4.3%
Thiamin B1 (mg)	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
RDA (M)	1.0%	8.0%	7.0%	4.0%	15.0%	10.0%	8.0%	7.0%	2.0%	5.0%	4.0%	23.0%	14.0%	10.0%
RDA (F)	1.3%	10.0%	8.0%	5.0%	18.8%	12.5%	10.0%	8.8%	2.5%	6.3%	5.07%	28.8%	17.5%	12.5%
Riboflavin B2 (mg)	0.1	0.1	0.9	0.1	0.2	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.2	0.2
RDA (M)	0.7%	3.9%	66.2%	9.2%	14.6%	9.2%	3.8%	5.4%	26.9%	8.5%	3.9%	10.0%	13.8%	16.2%
RDA (F)	0.9%	4.6%	78.2%	10.9%	17.3%	10.9%	4.5%	6.4%	31.8%	10.0%	4.6%	11.8%	16.4%	19.1%
Niacin (mg)	1.0	1.5	1.5	0.5	1.8	3.4	0.9	5.0	1.6	1.2	1.6	7.2	7.8	5.0
RDA (M)	5.9%	8.9%	8.8%	2.9%	10.6%	20.0%	5.3%	29.4%	9.4%	7.1%	9.4%	42.4%	45.9%	29.4%
RDA (F)	7.7%	11.5%	11.5%	3.8%	13.8%	26.2%	6.9%	38.5%	12.3%	9.2%	12.3%	55.4%	60.0%	38.5%
Vitamin B6 (mg)	0.1	0.1	0.2	0.1	0.2	0.7	0.0	0.4	0.1	0.1	0.2	0.8	0.4	0.5
RDA (M)	5.7%	5.7%	11.4%	3.6%	11.4%	49.3%	-	25.7%	5.7%	2.9%	12.9%	53.6%	27.1%	37.9%
RDA (F)	6.7%	6.7%	13.3%	4.2%	13.3%	57.5%	-	30.0%	6.7%	3.3%	15.0%	62.5%	31.7%	44.2%
Vitamin B12 (ug)	3.0	3.0	Trace	0.7	17.0	3.0	9.0	0.0	19.0	47.0	1.0	4.0	Trace	2.0
RDA (M)	200.0%	200.0%	-	46.7%	1133.3%	200.0%	600.0%	-	1266.7%	3133.3%	66.7%	266.7%	-	133.2%
RDA (F)	200.0%	200.0%	-	46.7%	1133.3%	200.0%	600.0%	-	1266.7%	3133.3%	66.7%	266.7%	-	133.2%
Folic acid (ug)	9.0	9.0	20.0	0.0	0.0	13.0	18.0	0.0	37.0	0.0	6.0	16.0	19.0	19.0
DRV (M)	4.5%	4.5%	10.0%	-	-	6.5%	9.0%	-	18.5%	-	3.0%	8.0%	9.5%	9.5%
DRV (F)	4.5%	4.5%	10.0%	-	-	6.5%	9.0%	-	18.5%	-	3.0%	8.0%	9.5%	9.5%

The nutritional composition data used in this table are drawn from the Food Standards Agency's benchmark, Holland B., Brown, J. & Buss, D.H. (1993). Fish and Fish Products. Third supplement to 6th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
**(Beef, average, trimmed lean, raw), *(Chicken, meat only, average, raw), *(Salmon raw), *(Cod frozen raw)*

Did you know.... that Cockles contain over 23 times the amount of vitamin B12 than beef and nearly 12 times more than salmon. Mussels contain over 9 times the amount of vitamin B12 than beef and nearly 5 times more than salmon.

Micronutrient Table - Minerals

per 100g	Shrimps (boiled)	Lobster (boiled)	Crab (boiled)	Prawns (raw)	Oysters (raw)	Squid (raw)	Scallops (steamed)	Octopus (raw)	Mussels (raw)	Cockles (boiled)	Cod*	Salmon*	Chicken*	Beef*
Sodium (mg)	1270.0	330.0	420.0	190.0	510.0	110.0	180.0	0.0	290.0	490.0	71.0	45.0	77.0	63.0
DRV (M)	79.4%	20.6%	26.3%	11.9%	31.9%	6.9%	11.3%	-	18.1%	30.6%	4.4%	2.8%	4.8%	3.9%
DRV (F)	79.4%	20.6%	26.3%	11.9%	31.9%	6.9%	11.3%	-	18.1%	30.6%	4.4%	2.8%	4.8%	3.9%
Potassium (mg)	130.0	260.0	250.0	330.0	260.0	280.0	240.0	230.0	320.0	110.0	340.0	360.0	380.0	350.0
DRV (M)	3.7%	7.4%	7.1%	9.4%	7.4%	8.0%	6.9%	6.6%	9.1%	3.1%	9.7%	10.3%	10.9%	10.0%
DRV (F)	3.7%	7.4%	7.1%	9.4%	7.4%	8.0%	6.9%	6.6%	9.1%	3.1%	9.7%	10.3%	10.9%	10.0%
Calcium (mg)	110.0	62.0	0.0	79.0	140.0	13.0	29.0	33.0	38.0	91.0	8.0	21.0	6.0	5.0
DRV (M)	15.7%	8.9%	-	11.3%	20.0%	1.9%	4.1%	4.7%	5.4%	13.0%	1.1%	3.0%	0.9%	0.7%
DRV (F)	15.7%	8.9%	-	11.3%	20.0%	1.9%	4.1%	4.7%	5.4%	13.0%	1.1%	3.0%	0.9%	0.7%
Magnesium (mg)	36.0	34.0	58.0	0.34	42.0	28.0	38.0	0.0	23.0	46.0	22.0	27.0	26.0	22.0
DRV (M)	12.0%	11.3%	19.3%	0.1%	14.0%	9.3%	12.7%	-	7.7%	15.3%	7.3%	9.0%	8.7%	7.3%
DRV (F)	13.3%	12.6%	21.5%	0.1%	15.6%	10.4%	14.1%	-	8.5%	17.0%	8.2%	10.0%	9.6%	8.1%
Phosphorus (mg)	89.0	260.0	340.0	180.0	210.0	190.0	240.0	170.0	240.0	140.0	180.0	250.0	160.0	200.0
DRV (M)	16.2%	47.3%	61.8%	32.7%	38.2%	34.5%	43.6%	30.9%	43.6%	25.5%	32.7%	45.5%	29.1%	36.4%
DRV (F)	16.2%	47.3%	61.8%	32.7%	38.2%	34.5%	43.6%	30.9%	43.6%	25.5%	32.7%	45.5%	29.1%	36.4%
Iron (mg)	0.6	0.8	1.6	1.6	5.7	0.5	1.1	1.2	5.8	28.0	0.1	0.4	0.7	2.7
DRV (M)	6.9%	9.2%	18.4%	18.4%	65.5%	5.7%	12.6%	13.8%	66.7%	321.8%	1.2%	4.6%	8.0%	31.0%
DRV (F)	4.1%	5.4%	10.8%	10.8%	38.5%	3.4%	7.4%	8.1%	39.2%	189.2%	0.7%	2.7%	4.7%	18.2%
Copper (mg)	0.6	1.4	1.8	0.2	7.5	0.1	0.2	0.4	0.2	0.4	0.1	0.1	0.1	0.1
DRV (M)	52.5%	112.5%	147.5%	11.7%	625.0%	81.7%	11.7%	33.3%	18.3%	31.7%	5.0%	6.7%	2.5%	2.5%
DRV (F)	52.5%	112.5%	147.5%	11.7%	625.0%	81.7%	11.7%	33.3%	18.3%	31.7%	5.0%	6.7%	2.5%	2.5%
Zinc (mg)	0.8	2.5	5.5	1.5	59.2	1.1	2.6	1.7	2.5	2.1	0.4	0.6	1.2	4.1
DRV (M)	8.4%	26.3%	57.9%	15.8%	623.2%	11.6%	27.4%	17.9%	26.3%	22.1%	4.2%	6.3%	12.6%	43.2%
DRV (F)	11.4%	35.7%	78.6%	21.4%	845.7%	15.7%	37.1%	24.3%	35.7%	30.0%	5.7%	8.6%	17.1%	58.6%
Chloride (mg)	1930.0	530.0	640.0	0.0	820.0	0.0	410.0	0.0	460.0	750.0	120.0	58.0	95.0	51.0
DRV (M)	72.2%	21.2%	25.6%	-	32.8%	-	16.4%	-	18.4%	30.0%	4.8%	2.3%	3.8%	2.0%
DRV (F)	72.2%	21.2%	25.6%	-	32.8%	-	16.4%	-	18.4%	30.0%	4.8%	2.3%	3.8%	2.0%
Manganese (mg)	0.1	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.2	0.8	0.1	0.1	0.1	0.1
Selenium (ug)	15.0	54.0	84.0	16.0	0.0	66.0	51.0	75.0	51.0	43.0	27.0	26.0	13.0	7.0
DRV (M)	20.0%	72.0%	112.0%	21.3%	-	88.0%	68.0%	100.0%	68.0%	57.3%	36.0%	34.7%	17.3%	9.3%
DRV (F)	25.0%	90.0%	140.0%	26.7%	-	110.0%	85.0%	125.0%	85.0%	71.7%	36.0%	43.3%	21.7%	11.7%
Iodine (ug)	33.0	100.0	0.0	21.0	60.0	20.0	20.0	20.0	140.0	160.0	110.0	37.0	6.0	10.0
DRV (M)	23.6%	71.4%	-	15.0%	42.9%	14.3%	14.3%	14.3%	100.0%	114.3%	78.6%	26.4%	4.3%	7.1%
DRV (F)	23.6%	71.4%	-	15.0%	42.9%	14.3%	14.3%	14.3%	100.0%	114.3%	78.6%	26.4%	4.3%	7.1%

The nutritional composition data used in this table are drawn from the Food Standards Agency's benchmark, Holland B., Brown, J. & Buss, D.H. (1993). Fish and Fish Products. Third supplement to 6th edition of McCance and Widdowson's The Composition of Foods. Royal Society of Chemistry, Cambridge.
**(Beef, average, trimmed lean, raw), *(Chicken, meat only, average, raw), *(Salmon raw), *(Cod frozen raw)*

Did you know....that iodine interacts with selenium in the production of thyroid hormones and that it is important that these elements are present in equal amounts? Iodine and selenium are present in shellfish in nearly ideal proportions?

> *Shellfish are low in fat with many species containing less than 1% .*

Healthy Eating and Obesity

Shellfish in a balanced healthy diet can protect against obesity and promote weight loss during dieting.

Shellfish are a particularly good protein source for those people trying on a weight control diet; they are high in protein, and low in fat and calories compared to other high protein foods such as meat and poultry.

The majority of shellfish are low in fat containing less than 5% fat with many species containing less than 1% fat. With such a small amount of total fat, most shellfish provide less than 130 kcal per a 100 g serving. A diet high in shellfish and other seafood, particularly those rich in omega-3s, such as crab, oysters, shrimp and lobster, may actually help prevent obesity.

Recent studies have shown that people with a high consumption of omega-3 rich shellfish and seafood were less likely to be overweight than those with low seafood consumption.

The preventative effects of shellfish have also been linked to the high levels of the amino acid arginine present in all shellfish; research has found that diets high in arginine encourage muscle growth rather than the deposition of fat.

Meals based on seafood have been shown to promote feelings of satiety (the sensation of feeling full) with the result that you want to eat less. The Holt Satiety Index of common foods, developed by researchers at University of Sydney, provides a scale of measuring how full a person feels after consuming a 240 kcal portion of a particular food and places shellfish second only to boiled potatoes.

The table below shows that you would have to eat close to half a kilo of cockles to gain 240 kcal but only 186 g of beef or 222 g of chicken!

Holt Satiety Index

	Shrimps	Lobster	Crab	Prawns	Oysters	Squid	Scallops	Octopus	Mussels	Cockles	Cod	Salmon	Chicken	Beef
Energy (kcal) per 100g	117.0	103.0	128.0	76.0	65.0	81.0	118.0	83.0	74.0	53.0	72.0	180.0	108.0	129.0
Size of serving equivalent to 240 kcal (g)	205.1	233.0	187.5	315.8	369.2	296.3	203.4	289.2	324.3	452.8	333.3	133.3	222.2	186.0

Did you know.... that the inclusion of shellfish and seafood in a weight control diet has been shown to actually enhance and promote weight loss when compared to similar diets lacking seafood?

Cardiovascular health

Regular inclusion of shellfish in a balanced diet can help protect from coronary heart disease (CHD).

Studies of Greenland Inuit and mainland Danish people of similar ages found that, despite a diet high in saturated fat and cholesterol but low in fruit, vegetables and complex carbohydrates, the Inuit population had a significantly lower risk of having a heart attack. Further studies have revealed similar results in other populations such as in Japan, Norway and Holland where high shellfish and seafood consumption is common. Long-chain omega-3 fatty acids, especially EPA and DHA which are almost exclusively derived from marine sources, are generally accepted to be the key nutrients in fish responsible for the cardioprotective effects of shellfish and seafood consumption.

There is also emerging evidence that the protective effects of dietary shellfish and seafood may also be due to other nutrients such as selenium which is found in high levels in shellfish.

Omega-3s from shellfish provide cardioprotective effects in a variety of ways:

Lowering blood pressure

Recent evidence suggests that a proportion of the cardioprotective effect of omega-3s from shellfish and seafood is produced by a small but significant reduction in blood pressure.

Anti-arrhythmic effects

An arrhythmia is a disturbance of the normal electrical rhythm of the heart suffering from CHD and is associated with sudden cardiac death. Studies have shown that EPA and DHA have anti-arrhythmic effects and can prevent fatal ventricular arrhythmias (uncoordinated coordination of the cardiac muscle) in patients recovering from heart attacks.

Reduction of atherosclerosis

Atherosclerosis is the condition where narrowing of the arteries occurs by plaques formed of fats and white blood cells, and is one of the most common underlying conditions in CHD. Rupture of these plaques can lead to a thrombosis or blood clot resulting in an interruption of blood supply to the heart and a heart attack. Omega-3s from shellfish protect against thrombosis by inhibiting clot formation. Shellfish derived dietary omega-3s have also been shown to stabilise antheroscerotic plaques thus preventing their rupture in the first place.

Reduction of cholesterol, free fatty acids and triglycerides

High levels of triglycerides and cholesterol are well established predictors of CHD and particularly the risk of having a heart attack. A number of studies have established that increased intake of omega-3s containing DHA and EPA from marine sources such as shellfish have beneficial effect on the levels of triglycerides and cholesterol in the blood.

Did you know....that the protective effect of regular shellfish and omega-3 consumption is greater for those people who already suffer from coronary heart disease or have suffered a heart attack?

Omega-3s found in shellfish can help reduce cholesterol levels in the blood.

The Cholesterol Myth

Contrary to the 'old wives tale' that certain shellfish (such as prawns) raise cholesterol it is now understood that the amount of saturated fat in the diet has a greater effect in raising blood cholesterol than the amount of cholesterol in the diet.

So while dietary cholesterol is present in prawns, crabs and lobsters, as well as in squid and octopus, they contain very little saturated fat and for most people do not cause a rise in the level of cholesterol in the blood.

Shellfish such as cockles, mussels, oysters, scallops and clams are very low in cholesterol, about half as much as chicken, and contain much less cholesterol than red meats.

Omega-3s found in shellfish can actually help reduce cholesterol levels in the blood and reduce the risk of heart disease.

"Dietary advice should focus on the type of fat in the diet. Individuals with high blood cholesterol often mistakenly seek out and actively avoid foods that are rich in cholesterol such as shellfish and eggs, whereas the key issue is to decrease saturated fatty acids."

Medical Research Council,
Human Nutrition Research

Regular consumption of shellfish may help to reduce the risk of certain cancers.

Cancer

Regular consumption of shellfish rich in omega-3s may help to reduce the risk of certain cancers.

The people living in countries that traditionally have diets with high levels of shellfish and omega-3 consumption such as the Greenland Inuit have been found to have lower risk of developing certain cancers including colorectal, breast and prostate cancer.

Recent research from Japan highlights the importance of shellfish and seafood in the diet; the westernisation of the diet among Japanese women has resulted in a decrease in the consumption of shellfish that has been linked to an increase in breast cancer.

It is unclear how regular consumption of omega-3 rich shellfish acts in preventing the development and progression of cancer but it may be linked to their role in the production of biological substances called eicosanoids that are important in regulating many of the body's systems.

Eicosanoids produced in the body from DHA and EPA have been found to moderate the process behind the development of blood vessels supplying blood to tumors.

In addition to the protective effects of omega-3 fatty acids found in shellfish, they are also sources of antioxidants in the form of essential minerals and vitamin E which may be important in the prevention of certain cancers.

All shellfish are good sources of selenium, copper, manganese and zinc which have antioxidant properties when combined with certain enzymes.

Antioxidant minerals have been shown to reduce the risk of cancer in some sections of the population and particularly men by 31%

Did you know.... that consumption of shellfish and seafood rich in omega-3s has been shown to reduce the risk of colorectal, breast and prostate cancer in some studies?

> *Omega-3s found in shellfish can help relieve the symptoms of joint pain.*

Arthritis and Joint Pain

Eating shellfish, particularly mussels and those rich in omega-3s and antioxidants can help relieve the symptoms of arthritis and joint pain. Populations with a high seafood and associated high omega-3 consumption often have a lower prevalence of both osteo- and rheumatoid arthritis.

The native coastal Maori population of New Zealand has a traditionally low incidence of arthritis and this has been linked to their regular consumption of green lipped mussels.

Extracts of omega-3 and other lipids from green lipped mussels have been shown to have anti-inflammatory properties and have had some positive results in reducing the symptoms of inflammation and pain associated with osteo- and rheumatoid– arthritis. The blue mussel, common in the UK and Northern Europe, has been shown in some studies to contain similar omega-3s as the green lipped mussel but in higher concentrations. Extracts of blue mussel have been shown to have similar potential for anti-inflammatory effects as green lipped mussel extracts.

Omega-3s from other shellfish and seafood sources have been shown to have beneficial effects on patients suffering from rheumatoid arthritis. Regular consumption of omega-3 rich shellfish and seafood has been shown to result in the reduction in symptoms such as tender joints, duration of morning stiffness, and arthritis related pain.

Shellfish such as crab and oysters are rich sources of omega-3s providing up to 1850 mg per 140 g serving and blue mussels from the UK and Europe contain 956 mg per 140 g serving.

Most other shellfish such as squid, shrimps, cockles, lobster and prawns are considered to be good sources of n-3 fatty acids providing more than 450 mg per 140 g serving.

Did you know.... that oxygen free-radicals may be important factors in causing the symptoms of arthritis, and that antioxidants found in shellfish including selenium, zinc and vitamin E may provide some protection from their effects?

> *The most abundant fatty acid in the brain is the omega-3 fatty acid DHA*

Lifelong Neurological Health

Regular consumption of shellfish rich in omega-3s and antioxidants is essential for the development and continued health of the brain and mental health.

It is thought that the human brain was able to evolve because of the high seafood and omega-3 consumption of early man living in coastal areas. The human brain, its cells and neurons, is composed largely of structural fats and lipids.

The most abundant fatty acid in the brain is the omega-3 fatty acid DHA which accounts for between 25-35% dry weight of polyunsaturated fatty acids in the brain and up to 50-60% of those in the retina. DHA is an essential fatty acid that can only be obtained from the diet and is commonly found in shellfish and seafood such as crab, oysters and mussels .

Regular consumption of shellfish and seafood rich in omega-3s, particularly DHA, is vitally important for pregnant and breastfeeding women as the maternal diet is the only source of omega-3s essential for neurological and neural function. Studies have linked maternal and infant dietary DHA intake from marine sources with the development of visual acuity of the eyes and the neural pathways associated with the development of language acquisition.

Regular omega-3s consumption from seafood has been linked to elevated IQ in young children; suggesting that a diet of pregnant and breastfeeding mothers that regularly includes omega-3 rich shellfish may be beneficial for the later mental development of children.

Did you know.... that 75% of the cells that the brain will ever have are formed before birth and that the essential fatty acids to build these come directly from the mothers diet?

Diets low in omega-3 have been linked with behavioural problems in childhood

ADHD, Dyslexia and DCD

Childhood behavioural and learning disorders can be addressed by increased omega-3 shellfish consumption.

Low seafood and omega-3 intake has been linked with behavioural and learning problems in childhood, particularly those associated with developmental co-ordination disorder (DCD), dyslexia and attention deficit hyperactivity disorder (ADHD). Studies have found that improvements in behaviour, coordination, reading ability and spelling in children diagnosed with ADHD, dyslexia and DCD can be brought about by increasing the amount of omega-3, such as those found in certain shellfish, in the diet.

Depression and Schizophrenia

Diets that regularly include shellfish rich in omega-3s and antioxidants can be beneficial for mental health.

Populations that have diets high in shellfish and seafood and therefore high intake of omega-3s, such as DHA and EPA, have been shown to have a lower incidence of depression. Studies have established links between levels of shellfish and seafood in the diet and a variety of depressive disorders including bipolar depression.

The link between seafood consumption and depression is complex but centres on the role of DHA and EPA in cell membrane metabolism and the transmission of neurotransmitters such as serotonin and dopamine which influence mood.

Studies have shown that people suffering from schizophrenia have low levels of omega-3s, particularly DHA, in their red blood cells. There is some evidence from clinical trials that omega-3s rich in EPA, such as those present in shellfish, can have a beneficial effect on people suffering from schizophrenia and can reduce the risk of sufferers from more serious symptoms.

Dementia and Alzheimer's disease

Omega-3 rich shellfish may provide protection from the onset of dementia and Alzheimer's disease. A growing body of evidence from population studies and laboratory experiments suggests that diets high in omega-3 rich seafood, such as crab, oysters and mussels, may protect against dementia.

In a study of over 8000 people aged over 65 from the French cities of Bordeaux, Dijon, and Montpellier it was suggested that weekly consumption of seafood including shellfish reduced the risk of dementia and Alzheimer's disease.

Did you know.... that in addition to the protective effects of omega-3s, antioxidants such as those common in shellfish, have been linked to the prevention of serious mental health conditions?

> *Diets that include omega-3s and antioxidants can be beneficial for mental health.*

Parkinson's disease

There is emerging evidence that suggests that regular consumption of shellfish rich in omega-3s and antioxidants may provide protection from Parkinson's disease.

Although this is a relatively recent area of research, studies in the US have reported a relationship between a reduction in the risk of Parkinson's disease with high levels of shellfish and seafood consumption in the population.

Laboratory experiments have also demonstrated neuroprotective effects of omega-3s in the diet.

There is further evidence that dietary omega-3s can be therapeutic in the treatment of some of the symptoms of Parkinson's disease such as depression.

100 g of crab meat contains 7 times more omega-3s than an equivalent serving of haddock and 5 times more than cod.

Did you know.... that the UK Scientific Advisory Committee on Nutrition has recommended that all adults should eat at least two portions of seafood every week, at least one of which should be oil-rich?

The **SAGB** supports the "enjoy seafood twice a week" campaign run by **Seafish**, the authority on seafood.

A portion of shellfish counts as one of your "2 a week".

Shellfish can play a key role in a healthy and balanced diet.

Shellfish are low in fat.

Shellfish are low in calories.

Shellfish are high in Omega-3s.

Shellfish are a good source of vitamins and minerals.

Shellfish can help reduce blood cholesterol.

Shellfish are tasty and nutritious.

Nutritional Traffic Lights
(based upon 100g raw product)

Lobster

LOW	Fat	1.6 g	2.3% RDA
LOW	Saturated Fat	0.2 g	1.0% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	0.8 g	13.8% RDA
103	Calories	103	5.2% RDA

Crab

MED	Fat	5.5 g	7.9% RDA
LOW	Saturated Fat	0.7 g	3.5% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	1.1 g	17.5% RDA
128	Calories	128	6.4% RDA

Prawns

LOW	Fat	0.9 g	1.3% RDA
LOW	Saturated Fat	0.2 g	1.0% RDA
LOW	Sugars	0.0 g	0% RDA
MED	Salt	0.5 g	8.0% RDA
76	Calories	76	3.8% RDA

Oysters

LOW	Fat	1.3 g	1.9% RDA
LOW	Saturated Fat	0.2 g	1.0% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	1.3 g	21.3% RDA
65	Calories	65	3.3% RDA

Squid

LOW	Fat	1.7 g	2.4% RDA
LOW	Saturated Fat	0.3 g	1.5% RDA
LOW	Sugars	Trace	0% RDA
LOW	Salt	0.2 g	4.6% RDA
81	Calories	81	4.1% RDA

Scallops

LOW	Fat	1.4 g	2.0% RDA
LOW	Saturated Fat	0.4 g	2.0% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	0.5 g	7.5% RDA
118	Calories	118	5.9% RDA

Octopus

LOW	Fat	1.3 g	1.9% RDA
LOW	Saturated Fat	0.3 g	1.5% RDA
LOW	Sugars	Trace	0% RDA
	Salt	Not Known	
83	Calories	83	4.2% RDA

Mussels

LOW	Fat	2.7 g	3.9% RDA
LOW	Saturated Fat	0.5 g	2.5% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	0.7 g	12.1% RDA
74	Calories	74	3.7% RDA

Cockles

LOW	Fat	0.6 g	0.9% RDA
LOW	Saturated Fat	0.2 g	1.0% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	1.2 g	20.5% RDA
53	Calories	53	2.7% RDA

Whelks

LOW	Fat	1.2 g	1.7% RDA
LOW	Saturated Fat	0.2 g	1.0% RDA
LOW	Sugars	Trace	0% RDA
MED	Salt	0.7 g	11.6% RDA
89	Calories	89	4.5% RDA

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