

*Littoral Treasures of Pink Gold, Illustrating Psalm 107:23-24:
Great Northern Prawn [Pandalus borealis], Baltic Prawn
[Palaemon adspersus], and Brown Shrimp [Crangon crangon]*

Dr. James J. S. Johnson



And God blessed them, saying, Be fruitful, and multiply,
and fill the waters in the seas (**Genesis 1:22**)

Three's a charm, when it comes to the delicious decapods of Norway's shrimp industry: **Deep-sea Northern prawns, Baltic prawns, and European Brown Shrimp!** As the quotations below indicate, the commercial shrimping industry is a very serious and learned profession -- forget about fisherman's "luck" if you are serious about catching cold-water shrimp in commercially profitable quantities!

But before looking at some of the technical biology and ecology of these crustaceans, consider the delightful options for consuming them, such as when they sit atop Scandinavian **smørrebrød** (a cuisine favorite in Denmark and Norway), best known in America as the "open-face sandwich".

As the term **smørrebrød** (which is a contraction of "**smør og brød**", meaning butter and bread") suggests, traditional **smørrebrød** begins with a firm foundation, a slice of rye bread ("**rugbrød**") carpeted with real butter. Next comes

the artistically presented **pålæg** (meaning “on-lay”), i.e., layer or layers upon the butter-bread slice. The **pålæg** often includes cold-cut meat slices, smoked salmon, herring, cheese slices, spreads (e.g., salmon spread), cucumber slices, tomato slices, boiled or stuffed egg slices, pieces of lettuce (or shredded basil leaves), parsley sprigs, scallions, bacon, and/or peeled-and-cooked **SHRIMP**. Due to the shape of shrimp, if included, it often tops a **smørrebrød**.



Baltic nations enjoy open-faced sandwiches, too. The term **smørrebrød** in Estonia is **võileib** (meaning butter-bread); in Finland a similar word, **voileipä**, is used. (And it’s hard to imagine Tallinn’s Estonian rye bread being improved upon!)



The Norwegian shrimp industry has been a serious enterprise for generations, especially after the Nordic shrimp fishery became a science-managed industry exploiting research by 2 of Norway's most diligent marine ecologists, **Dr. Johan Hjort** and **Dr. Johan T. Ruud** (and others), at and after the beginning of the 20th century (AD). Three of the most important shrimps, for Scandinavians, are the **Northern Prawn** (*Pandalus borealis*), the **Baltic Prawn** (*Palaemon adspersus*), and the common European **Brown Shrimp** (*Crangon crangon*).



NORTHERN PRAWN (*Pandalus borealis*; a/k/a GREAT NORTHERN PRAWN, NORTHERN PINK SHRIMP, DEEP-SEA PRAWN, COLD-WATER PRAWN, etc.)

This deep-seawater, soft-mud-dwelling, pink, caridean shrimp is found in the North Atlantic Ocean, and in its extensions (such as the North Sea), as well as in the Arctic Ocean (e.g., near Svalbard) and in the Northern Pacific Ocean.

Off coastal areas of northeastern North America that are swept by the Labrador Current lives *Pandalus borealis*, the northern shrimp, which, because of its color, is also known as the pink shrimp. This species is circumpolar [and abundant], living in the depths of boreal and subarctic seas throughout vast areas of the Eastern and Western Hemispheres. Commercial fisheries for this shrimp exist in Alaska, British

Columbia, **Norway**, Sweden, British Isles, Iceland, southern Greenland, Newfoundland, the Canadian Maritimes, and northern New England.

For several decades, the pink shrimp [*Pandalus borealis*] was plentiful enough off the coast of Maine to support a small but profitable winter fishery. The catch, primarily taken by otter trawls, mainly consisted of large egg-bearing females, which congregate near the mouth of estuaries and on other inshore grounds prior to the time when they hatch their eggs. In the waters off Maine, hatching of eggs reaches a peak in March and April.

[Quoting Dorothy E. Bliss, *Shrimps, Lobsters and Crabs: Their Fascinating Life Story* (Columbia University Press, 1990), pages 48-49.]



For Nordic countries, Northern Prawns are commercially valuable as seafood.

The deep sea prawn, *Pandalus borealis* Krøyer, is fished extensively in Norwegian, Swedish and Greenland waters, some 4000 metric tons being caught annually, having a value of about £800,000. Its biology has been investigated by various workers in these countries. ... Despite this, relatively few populations have been sampled at regular intervals throughout a year. In high latitudes where much work has been carried out, ice, for varying lengths of time, prevents stocks from being sampled. [Birger] Rasmussen (1942, 1949, 1953) has shown that the life history of *P. borealis* varies with locality in a range from southern Norway to Spitsbergen.

When *P. borealis* was found in numbers in deep water off the Northumberland coast, advantage was taken to investigate the biology of the species at the southern limit of its eastern Atlantic distribution and to compare the results with those of other workers.

[Quoting J. A. Allen, "On the Biology of *Pandalus borealis* Krøyer, with Reference to a Population Off the Northumberland Coast", *Journal of the Marine Biological Association of the United Kingdom*, 38(1):189-220 (February 1959).]

These prawns can grow quite large -- for shrimp! -- with males sometimes reaching almost 5 inches in length, whereas females may grow up to 6½ inches. These crustaceans can live up to 8 years.

But to say that this shrimp's life cycle (like that of other shrimps) is complicated, and odd, is an understatement! Obviously, the Nordic shrimp industry needs to understand how these prawns reproduce, grow, and develop, in order to conserve and maximize harvesting of these valuable shrimp populations.

The deep sea prawn, *Pandalus borealis*, is a crustacean with a life history of a very complex nature. Through the investigations by various authors in the 1930's it was discovered that the deep sea prawn is a protandric hermaphrodite, i.e., the prawns have the ability to change their sex in such a manner that they early in life act as males and later on change their sex and act as females. The investigations indicated further that the growth and maturing of the prawn were largely uniform in the different areas investigated, as for instance on the Pacific Coast of Canada, in the Gullmar Fjord (Sweden), in the Oslo Fjord (Norway) and in the Skagerrak [i.e., Skagerrak]. In all these localities the prawns generally functioned as active males when 1½ years of age, and it was surmised that a few prawns could act as spawning males for more than one year.

In 1942 the present author [Birger Rasmussen] published a report on the deep sea prawn in Spitsbergen [Svalbard] waters. The investigations proved that the growth and sexual development in this Arctic area were much slower than in any of the localities investigated previously. In Spitsbergen waters, for instance, the prawn did not mature as male till 3 years of age, acted as male also in the fourth year, and did not reach the female stage till 5 years of age. ...

[*The present data clash with*] previous conceptions that the life history [i.e., *life cycle*] of the deep sea prawn should be largely uniform in its whole area of distribution. The growth and maturing change, not only from one locality to another, but also from brood to brood born in different years in one and the same locality. ... The [research] results seem to prove that decreasing temperatures in the sea cause slower growth and retarded maturing. This means for one thing that generally we will find more slow-growing and slow-maturing prawns the farther north we go. And furthermore, in Norway prawn fields are found in many of the so-called 'threshold' fjords which have a shallow barrier across the entrance. In these fjords we often find lower temperatures and salinities near the bottom than on the

prawn fields situated in 'open' water. The prawn populations in these threshold fjords may, without special regard to geographic latitude, show a life history approaching that of the slow-growing prawns in Arctic waters. As examples we may refer to the Sogndal Fjord in Vestlandet district, the Mist Fjord in Nordland, and the Bals Fjord in Troms district.

In regard to the spawning season, of the prawn, we also in this respect find features which seem to conform to certain rules [i.e., trends]. On the majority of the grounds, particularly in Southern Norway, the prawns spawn in October—November, the females carrying their eggs for about 5 months till the eggs hatch in March—April. However, in the Arctic waters of Spitsbergen spawning takes place 3 months earlier than in Southern Norway, the eggs hatching 2 months later during the next spring, the ovigerous period thus lasting for about 9 months. The Jan Mayen area shows a similar picture, while the threshold fjords in Norway present intermediate features. The Bals Fjord and other fjords in Northern Norway have a probable ovigerous period of 7—8 months, while prawns in the Mist Fjord further south carry their eggs for 6 months. In all these localities the spawning commences earlier in autumn than what is the case in Southern Norway. The general rule seems to be that the colder the environment, the earlier the spawning and the longer the ovigerous period.

Eggs of fishes and other marine [life-]forms need a longer time for hatching in low temperatures, and the same seems to be the case with the eggs of the deep sea prawn. In the case of *Pandalus borealis* Nature [sic] seems to have provided for this contingency through early spawning and late hatching in cold surroundings, i.e. through a prolonged ovigerous [i.e., egg-bearing] period. ... And furthermore, in a prawn population or any year class [i.e., brood-year] of prawns the number of individuals maturing respectively as males and females is determined not so much by the age as by the size attained before spawning time. ...

Nature [sic -- here Birger Rasmussen is idolatrously replacing the Creator-God with an ecosystem-regulating, quasi-animistic/paenentheistic personification named "Nature" – almost like the magical "Force" of Star Wars fiction] regulates the number of prawns which are to stay immature, or which shall spawn as males and females, all in relation to the local rate of growth, i.e. in the environment.

In the Oslo Fjord we can for instance find a year class of prawns, 1½ years of age, divided into three fractions containing respectively immature youngs [*the original and thus default sex of which is male, albeit not yet reproducing*], mature males, and spawning females. Older age groups in any locality usually divide so as to form one male and one female fraction.

The principle governing the mechanism of division seems to be that the largest individuals in any group of prawns change into females, while the fraction containing the smaller prawns constitutes the males' part. The very smallest individuals of a year class [*i.e., brood-year*] may form the third fraction of immature youngs [which are not yet capable of reproducing].

This division of an age group into different sex categories is closely connected with the attainment of a more or less definite size level. If for instance an age group has attained a mean [*i.e., average*] size of 80—90 mm in autumn only a few individuals will mature as females. If the mean size is 100—110 mm perhaps 25—75 per cent will be females. Age groups having attained a mean size of 120 mm will generally consist of females only.

The lengths stated only indicate the trend of sexual development. Variations in the relationship can be found in the different localities.

The sex division within a group of prawns having functioned as males generally starts in winter and continues throughout the following spring. The general rule seems to be that the largest males of the group undergo the transformation into females first. The individuals which have succeeded in the transformation have in subsequent months an accelerated rate of growth, while the prawns which do not succeed in changing their sex apparently are restricted in their growth. As a natural consequence we find after a while that for instance an age group of 2½ year-old prawns can consist of two distinct fractions, one size group of small males, and another one of large females, but both of identical age.

Environment, rate of growth, and sexual maturing are closely connected factors which find their expression in the varied life histories [*i.e., life cycles*] of the deep sea prawns on the many prawn fields between Skagerak [*i.e., Skagerrak*] and the Arctic seas. The prawn can sustain life, and multiply, within a wide range of temperatures, submitting to local conditions, growing and maturing in conformity to laws laid down by Nature [*sic* – here again Rasmussen is replacing the Creator-God with a personification he calls “Nature”, which he deems to be an ecosystem-regulating and quasi-animistic/panentheistic substitute for the God Who sustains His own creation – this “science” falsely so-called illustrates the indictment of **Romans 1:25**, which notes how ungodly minds falsely transfer credit to the physical creation, rather than rightly appreciate God’s glory as the Creator and Operator of the entirety of His creation].

[Quoting pages 152-153, in Birger Rasmussen, “On the Geographical Variation in Growth and Sexual Development of the Deep Sea Prawn (*Pandalus borealis* Kr.)”, **Reports on Norwegian Fishery & Marine Investigations**, 10(3):1-158 (1953).]



Early research by Dr. Johan Hjort shifted from shrimp migration analysis to shrimp life cycle studies, focusing on demographic population dynamics that emphasized how these cold-water prawns became fruitful and multiplied at the brood level, based upon relative success of larval graduating “class years” [*i.e.*, *brood-years*].

The shrimp research’s emphasis on population statistics followed Dr. Hjort’s statistical studies, using actuary principles, of Norwegian fishermen, as part of a project to establish fiscally practical insurance programs for Norway’s fishermen and their families. Actuarial calculations can be applied to shrimp lifespans, too!

If you don’t expect to find shrimp, you probably won’t look for them.

Dr. Johan Hjort was a trail-blazing ecologist who researched cold-water fishery populations (cod, herring, shrimp, and even whales).

In AD1898, after modifying a deep-sea fishing trawl, Hjort found large populations of **Great Northern Prawn (*Pandalus borealis*)** in muddy sediments below Norwegian fjords. Because those shrimp were deemed “rare” and commercially irrelevant, Dr. Hjort’s reports were ignored.

To refute naysayers, Hjort chose actions over words:

[Hjort] went prawn fishing, returned to harbor with a spectacular catch and dumped it on the quay. ... With that practical demonstration he laid the foundation of an exceedingly profitable [*Pandalus borealis*] fishery and a flourishing export trade.

And, as an aside --- just to show that ***the scientific community/establishment has not learned much from Dr. Hjort's breakthrough*** with *Pandalus borealis* populations, --- just consider the sluggishness of modern paleontologists, nowadays, when it comes to researching Carbon-14 residues in dinosaur bones! Evolutionists, for generations, assumed that dinosaur bones are too old to have any measurable Carbon-14, so they don't look at how much has always been there, exhibiting that dinosaurs died rather recently, not millions of years ago.

Dinosaurs and Dating

Since the 1990's scientists have discovered:

- ◆ Soft tissue in dinosaur bones.
- ◆ Unfossilized dinosaur bones.
- ◆ Proteins in dinosaur fossils.
- ◆ Red blood cells in dinosaur fossils.
- ◆ DNA in dinosaur fossils.
- ◆ Carbon-14 in dinosaur fossils.

Yet there it is, waiting to be noticed! — “young” radiocarbon inside supposedly “ancient” dinosaur bones, an evolutionist's nightmare! [For more on this, see Brian Thomas, “Carbon-14 Found in Dinosaur Fossils, ***ICR Creation Science Update*** (7-6-2015), <http://www.icr.org/article/carbon-14-found-dinosaur-fossils/> , citing Brian Thomas & Vance Nelson, “Radiocarbon in Dinosaur and Other Fossils”, ***Creation Research Society Quarterly***, 51(4):299-311 (spring 2015). See also, accord, Jake Hebert, “Rethinking Carbon-14 Dating: What Does It Really Tell Us about the Age of the Earth?”, ***Acts & Facts***, 42(4):12-14 (April 2013), <http://www.icr.org/article/rethinking-carbon-14-dating-what-does/> .

But it's not just extinct dinosaurs that are proving to be a lot more recent than many thought, ***similar “soft tissue” surprises are hidden in “ancient” shrimp fossils, too!*** [See Brian Thomas, “Remarkably Preserved’ Shrimp Is 350 Million Years Old? --- Original Biochemistry Shows that Fossils Are Recent”, ***Creation Science Update***, 11-18-AD2010, <http://www.icr.org/article/remarkably-preserved-shrimp-350-million/> , citing “Fresh Tissues Show Fossils Are Recent”, posted at <http://www.icr.org/fresh-fossils> .]

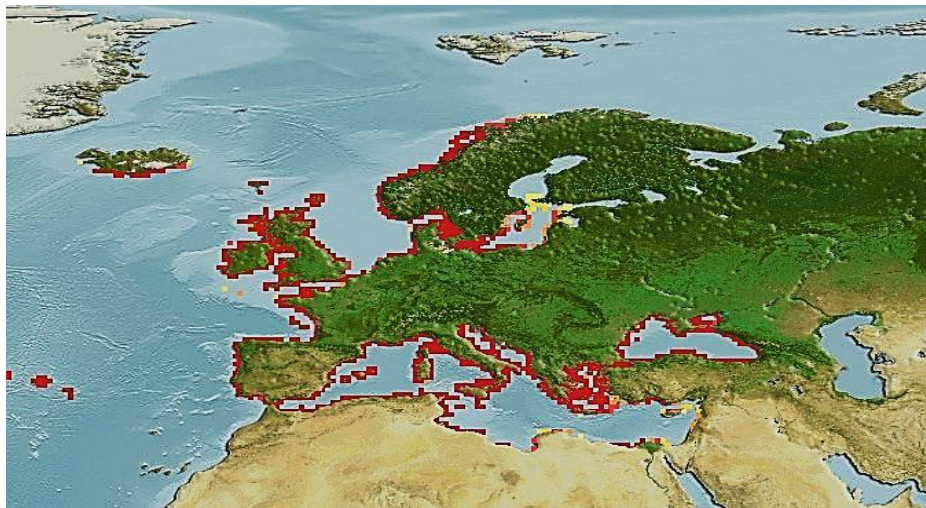
Aside over, back to the Nordic world's shrimp industries. In Scandinavia's warmer seas, a smaller shrimp thrives, the **Baltic Prawn** (a/k/a the Baltic Shrimp).



BALTIC PRAWN (*Palaemon adspersus*; a/k/a Baltic Shrimp, Fjord Shrimp)

So where in the world do shrimp-fishing boats find these Baltic Prawns? These shrimp are both little (in size) and littoral (found in coastal sand/mud-bottoms).

In the Baltic Sea, of course, but also elsewhere! Notice the red-colored coastal areas in the computer-generated map below (compliments of *AquaMaps.org*). These small tasty shrimp live in many other warm waters of Europe's coastlands.



The coastal estuary mud-waters preferred by Baltic shrimp routinely host *Zostera* “beds”, i.e. coastal/estuarial mud-bottom “beds” dominated by long, thin *Zostera* seagrasses (a/k/a “marine eelgrass”), which are attached (by branching rhizome root systems) to the muddy-sand bottoms of estuarial coastlines. Baltic prawns are prey for various bony finfish, so hiding in eelgrass “thickets” is a good defensive strategy for shallow-water shrimp survival, especially when young.

But are these delicious-tasting decapods properly called “**shrimp**” or “**prawns**”?

You may have wondered about the technical differences between shrimps and prawns. According to British usage, the term shrimp is restricted to forms having a **crangonid**-like appearance [*like the European Brown Shrimp, **Crangon cragon**, discussed later, below*], while prawn is used for forms with a **palaemonid**-like structure [*as appears on the Baltic Prawn, **Palaemon adspersus***]. ... [But] this distinction works only for species restricted to northern Europe. When applied to forms found elsewhere, the distinction is artificial. Thus, according to the British definition, penaeids would have to be called prawns, but in the United States at least, they are always referred to as shrimps. According to the British definition, the only true shrimps in North America are the crangonids of the Pacific coast – and indeed, with one exception, these are called shrimps. Yet the exception, the largest species of commercial importance, is often called a prawn on the basis of its relatively large size. Thus, American usage bestows the term prawn upon species of large size.

[Quoting Dorothy E. Bliss, ***Shrimps, Lobsters and Crabs: Their Fascinating Life Story*** (Columbia University Press, 1990), pages 22-24.] Of course, another American habit is to call any large shrimp (or prawn) a “**jumbo shrimp**” – notwithstanding that zoölogist **Frank Sherwin** deems that phrase an oxymoron. Compared to the deep-sea **Northern Prawn** (*Pandalus borealis*), discussed above, the **Baltic Prawn** (*Palaemon adspersus*) is quite small -- often only half the size of the Nordic Prawns, not even growing to 3 inches in length at maturity. But the wonderful taste justifies the shelling efforts!



Baltic Prawn (photo by Katriina Könönen)

To further complicate the semantics, studies of deeper-than-usual ***Palaemon adspersus*** (such as some found in southern Black Sea waters ~ 90 feet deep) report that some of these “Baltic Prawns” grow larger than their shallow-water cousins. [The Baltic Prawn’s close cousin is ***Palaemon elegans***, “Rockpool Shrimp”, but much said about ***Palaemon adspersus*** (“Baltic Prawn”) applies also to the Rockpool Shrimp. In fact, and some recent studies suggest that older studies confused the 2 species— so I will not further add to that confusion here!]



Black-necked Grebe eating Baltic Prawn (photo by Jivko Nakev)

But yet another common shrimp is often netted along the coasts of Norway, the European crangonid ***Brown Shrimp***!



Brown Shrimp (photo by Rokus Groeneveld)

BROWN SHRIMP (*Crangon crangon*; a/k/a NORTH SEA BROWN SHRIMP, in French: *CREVETTE GRISE*; Dutch: *GRIJZE GARNAAL*; British: GREY SHRIMP)

This shrimp is a sandy/brownish-grey caridean crustacean fished in many European coastal waters, mostly in the southern North Sea, yet also found in the Baltic Sea, Irish Sea, N.E. Atlantic, Mediterranean Sea, and Black Sea. Commercial consumption of the Brown Shrimp is illustrated in the markets of Germany, Netherlands, and Denmark, as well as in The United Kingdom, Belgium, and France. Like littoral Baltic Prawns, the North Sea Brown Shrimp are small, with adults growing to about 2 inches long, although some have been found to have reached lengths of up to 3½ inches. Like the Baltic Prawn, the Brown Shrimp lives in relatively shallow, estuarial/brackish, coastal waters, actively feeding at night. During the daytime they can submerge in sandy mud-bottoms, with only their antennae protruding (for gaining vital information about activities nearby), so that they are not conspicuous to predatory fish or shrimp-eating seabirds.

The Brown Shrimp is the edible “star” within a Belgian cuisine specialty, the ***tomate-crevette***, i.e., the nutritious and scrumptious shrimp-stuffed tomato!



Tomates-crevette à la belge (photo by Marmiton.org)

This artistic food is composed of a cored (i.e., hollowed) tomato, uncooked, stuffed with a mix of cooked-and-peeled Brown Shrimp and mayonnaise. (Also, for variety, avocado may be included into the mix, for extra flavor.)

In Great Britain, however, **North Sea Brown Shrimp** (there also called “Grey Shrimp”) constitute the key ingredient in another famous food: “**potted shrimp**”.

What Are Potted Shrimp?

Potted shrimps are a traditional British food and loved here for centuries. Traditionally they are being made with the tiny brown shrimp found around Morecambe Bay, known as Morecambe Bay Shrimp in North West England, though any small shrimp can be used. The shrimp are first boiled, and traditionally this would be in sea water. The shrimps are then shelled and mixed in a spiced, - mace, or nutmeg, a pinch of pepper – maybe even a hint of cloves – clarified butter. The butter must be clarified as the clearing of it helps in the preservation of the shrimp underneath [*i.e., the clarified butter functions like the air-excluding crust of a traditional pie, to retard spoilage of the cooked meat underneath*].

How Are Potted Shrimp Served?

The shrimp are traditionally served on slices of thin warm toast. Another great suggestion for serving, though not traditional, is to stir the shrimp and butter through freshly cooked pasta.

How Are the Shrimp Potted and What Pots Are Used?

Though traditionally the shrimp were preserved in China or earthenware pots, nowadays they are mainly found served in plastic tubs. This method of preserving the shrimp is believed to date back to Tudor times and the industry as a whole expanded in the 19th century, when thanks to the development of the railway networks, demand for the shrimp grew.

[Quoting Elaine Lemm, “What Are Potted Shrimps?”, **The Spruce Eats**, 7-17-AD2018, <https://www.thespruceeats.com/what-are-potted-shrimps-435446> , including the photo below, displaying recently shore-collected *Crangon crangon*.]





TAXONOMY FOLLIES

So, what's in a name? The Food & Agriculture Organization (FAO) of the United Nations refers to *Pandalus borealis* as “Northern Prawn”. But the same pink cold-water crustacean also sells, in commercial and consumer markets, as “Norske Reker”, “Cold-water Shrimp”, “Pink Shrimp”, “Deep-water Prawn” (or “Deep-sea Prawn”), “Great Northern Prawn”, “*Crevette Nordique*”, and “Northern Shrimp”.

The Food & Agriculture Organization (FAO) of the United Nations refers to *Palaemon adspersus* as “Baltic Prawn”. But the same sandy-salmon-colored littoral crustacean also sells as “Allmän Räka” (Swedish: “common shrimp”), “Strandreke” (Norwegian: “Coast line Shrimp”) and “European Shrimp” (Russian).

The Food & Agriculture Organization (FAO) of the United Nations refers to *Crangon crangon* as “Common Shrimp” and “Crevette Grise [i.e., Grey Shrimp]”. But the same sandy-salmon-colored littoral crustacean also sells as “Sandräka” (Swedish “Sand Shrimp”) and “Nordseegarnele” (German: “North Sea Shrimp”).