

The Success of Snails

by Simon Terry

This article was written in response to the following question sent to the Ask John Mackay [website](#):

Can you please ask your snail man how did the snails survive the flood and how would they have gotten around the whole world at snail's pace afterward and formed the thousands of species in today's world? Surely show evolution and continental drift is a better answer.

Simon Terry's answer

The survival and spread of snails and their broader class the Gastropoda is better appreciated when we understand the character of the biblical kinds given in the book of Genesis. Only when we start with this biblical basis can we better understand the success of specific species and geographic isolation of others.

The Character of the Kinds

Ten times in Genesis chapter 1 we read that God created the kinds. What is a kind? Broadly speaking it is the grouping of similar species that scientists refer to, using our current classification system, as families. There can be great variety in that family but it's easy to see which family each species belongs to.

The original replicators of today's species had the genetic potential to reproduce the great variety we see today in those families. Once we recognise that today's species are representatives of the original kinds we begin to see, contrary to Darwinian thought, that many of the qualities, characteristics, strengths and weakness are either lost, isolated or separated out through speciation.

Snails are split into two very broad categories or orders – the Pulmonates which breathe using a pallial lung being mainly land based (although some can be found in freshwater and some in the sea), and the Prosobranchs which use gills to breathe being mainly marine (although some can be found in freshwater). Let's not forget that in the beginning the number of species (being representatives of the kinds) would have been smaller and prior to the flood speciation would have had around 1656 years to develop.

The Conditions During the Flood

Some snails are amazingly designed to survive climatic changes by entering a phase of dormancy known as aestivation or hibernation. Conditions during the flood may have induced many of the gastropods to one or either of these states. The onset of drought or cold temperatures stimulate many snail species to seal the aperture of their shell with a thin layer of mucous that dries called an epiphragm.

The Garden snail (*Cornu aspersum*) is adept at gluing itself to walls and elevated plants during aestivation and in winter this species can be found clustering together in communal roosts in sheltered places. It is therefore highly likely that the land based snails spent the majority of their voyage roosting on the eaves of the ark, sealed up and asleep waiting for the flood waters to recede.

Photo: *Cornu aspersum* aestivating against a Buddlea bush during dry summer conditions.



Most of our land based Pulmonates are detritivores and so any active specimens during the voyage would have survived on detritus material which we can imagine would be abundant on a boat loaded with animals. They are designed to literally clear up providing an invaluable service in decomposition. Any food stuffs provided as feed for the other livestock would have sufficed for the various kinds represented.

Even some of the freshwater Pulmonates that have a pallial lung would have lived through the flood resting on floating timbers and vegetation. During the recessional phase of the flood as the waters drained back in the new ocean basins many of the freshwater species could well have been left behind in lakes enabling their kind to colonize new ecological niches. The Prosobranchs (sea snails) would have survived perfectly in the ocean.

The Colonisation of the Continents

The term 'snail's pace' is quite misleading - they can actually achieve great ends by their 'paced progress' covering considerable distances. Several striking factors favour their spread and survival and by looking at these we can begin to see how different species have covered great distances since the flood, setting up camp in specific habitats which can prove either favourable or unfavourable to their settlement.

One of the greatest examples we can look at in answering this question is the success of the species *Achatina* (*Lissachatina*) *fulica* (Bowdich, 1822) or the Giant East African Snail. Over the course of the late nineteenth century this giant snail travelled east from its homeland in East Africa to the shores of Southeast Asia where it then went on to populate many of the Pacific islands. As of today the species has taken up residence in Florida drawing the powers of the pest control agencies in order to attempt its eradication. The snail has been poisoned, fired at by flame throwers, trapped, collected and even left to the voracious Rosy Wolf Snail (*Euglandina rosea*). By using this species as an example we can build a picture of how other snails have gained or lost ground.



Photo: The Giant East African Snail (*Achatina fulica*) - a pet specimen from Leicestershire. Some have shell lengths of just under 8 inches (20cm) and can weigh over 400 grams. Copyright Simon Terry

Transport

One of the chief agents that has literally carried snails across the continents is man - whether accidentally as uncovered cargo tucked away amongst man's possessions and/or in some cases quite deliberately introduced to foreign soil as a food source.

Land snails have a habit of crawling into and resting in the most difficult of recesses. Any item left outdoors can provide an ideal roost. The great success of the Giant East African Snail has been its propensity to hide amongst all manner of materials - some have been intercepted at ports tucked away among bunches of bananas in Micronesia, others in freight from flower pots sent from Mauritius to infestations among orchid shipments bound for Java in Riouw Archipelago(1).



Above Left: The Garden Snail (*Cornu aspersum*) collected from a back garden in Wigston (UK).
Above right: The Roman Snail (*Helix pomatia*) found chomping through the petiole of Cow Parsley (*Anthriscus sylvestris*) in Surrey (UK). Copyright Simon Terry

The rearing, cooking and eating of snails has also led to species being spread far and wide. It is highly likely the ancient Romans brought snails with them to England for food. The 'Roman Snail' (*Helix pomatia*) - a European species is now protected under the Wild Life and Countryside Act partly because of its notable size and edible qualities. Another snail – the Garden Snail (*Cornu Aspersum*) is also regarded as a Roman introduction. While this species has colonised vast areas of the country, the Roman Snail contrastingly despite its larger size, is only found in the south. In France the Garden Snail is bred for food commonly known as the *Petis gris*. Its bigger counterpart the *Gros gris* also bred commercially as a food source has been crossed and selected with the *Petis gris* to produce a strain known as the *Blond des Flandres* which looks like the Roman Snail but is easier to rear.

Birds can also play a role as vectors in dispersal. A study conducted in Japan revealed that 15% of the species *Tornatellides boeningi* - a small land snail endemic to islands in the South Pacific, survived their journey through the guts of two bird species. They also found an interesting correlation between the genetic diversity of studied snail populations and the density of the bird species - the Japanese White Eye (*Zosterops japonicus*) (2).

The wide distribution of the species the Great Pond Snail (*Lymnaea stagnalis*) although introduced deliberately in many places to British ponds by man may also be transported and relocated by birds (3). It may be possible for pond plants harbouring the sticky egg masses of pond snails to be carried by water fowl across water ways further contributing in the colonisation of species.



Photo: The Great Pond Snail (*Lymnaea stagnalis*) crawling at the water's surface. This species has a widespread distribution, found throughout Europe, Asia and North America.

Surtsy island off the southern coast of Iceland grew out of the sea in 1963 from volcanic eruptions. Since its cooling, numerous plants and animals have taken residence including two gastropods species – the Western Glass-snail (*Vitriina pellucida*) which is a semi slug (see article on evolution for more on semi slugs) and the Grey Field Slug (*Deroceras agreste*). Both these species favour moist habitats and could have been carried by birds carrying nesting material.

Aestivation and Hibernation

The snails ability to survive adverse conditions through either aestivation (which can in some cases be months without food or water) or hibernation can enable some species to restock existing populations even if predation or other pressures have depleted old stocks. This in turn can help a species gain further ground in colonising a new habitat.



Above Left: The hibernating Roman Snail sealed with an epiphragm impregnated with chalk.
 Above Right : The shiny muco-calcareous epiphragm of *Achatina fulica*. Notice the grooved slit (see arrow) which covers the pneumostome or breathing pore, enabling the snail to respire while sealed up. Copyright Simon Terry

In studying hibernation in the Roman Snail we see further marvels of God's design. After excavating a hollow and pulling in surrounding vegetation the snail produces an epiphragm which is reinforced with chalk. As the snail retreats further into its shell it creates a cushion of air, providing added protection from freezing temperatures.

Internally the snail makes further significant changes. Von Brand in 1931 confirmed that the water content is lower in hibernating *H.pomatia* than active individuals. Active snails must be kept moist and so must avoid water loss, but during winter this could be detrimental. Further studies by Kamada in 1933 showed that the blood of hibernating *H.pomatia* has a higher isotonic percentage of Sodium Chloride to active snails - that is the equivalent to making your own anti-freeze. This and other incredible physiological changes enable this European sun loving species to endure the bitterness of the British winter.

Tolerance

Some specialist species can be limited in their distribution, requiring specific environments whereas other species are more generalist and therefore are not as confined or restricted in their choice of habitat. The ability therefore a species has to tolerate the extremities of climate can greatly effect its distribution and vice versa.

The Giant East African Snail has been able to extend its range despite cold conditions. According to Meade (4) well established populations are found on the Bonin Islands where temperatures drop as low as 45 degrees Fahrenheit. In Florida *Achatina fulica* has alarmed the Florida Department of Agriculture and Consumer Services. The snail's tolerance for Florida's winter period has enabled this remarkable species not only to survive but to spread. GALS as they are known which covers a range of giant African land snail families cannot be imported to America because of the great threat not just of their colonisation but also their effect upon agriculture and public health.

In the UK we have seen the rapid spread of the Girdled Snail (*Hygromia cinctella*). This is a Mediterranean species, yet has found a home in England. It was first reported in Devon in 1950 and has now covered many areas in the south. The snail is quite distinctive with a white keel running around the body whorl. A few miles from where I live just south of Leicester, the country estate of Evington Park recorded the presence of the species in May 2012.



Photo: The Girdled Snail (*Hygromia cinctella*) found on the crawl during a cold February (2016) in Birstall, Leicestershire. Notice the distinctive 'keel' on the centre body whorl.

Cornu aspersum seems to have seen the world, travelling far and wide to regions which differ significantly from its Mediterranean roots. You would have thought that low winter temperatures would have prevented its penetration to northern climates but this evidently is not the case. Surprisingly, this species has spread as far north as the Orkneys - an archipelago in the northern isles of Scotland (5)(6). Its tolerance and ability to survive harsh winters has enabled this species to colonise almost every continent.

Sadly in our devolving world some species are finding some habitats more and more unfavourable.

The Glutinous snail (*Myxas glutinosa*) which although looks very similar to the Wandering Snail (*Lymnaea peregeris*) is sensitive to pollution. The species is now registered under the UK Biodiversity Action Plan (UK BAP).

Reproductive Potential

Depending on the species, snails can lay anywhere from one single egg at a time as seen in the family *Acavidae*, to over a hundred (*Achatina fulica*). Some species are ovoviviparous with the eggs hatching inside the adult to emerge as fully formed hatchlings. This ability can help shield the developing eggs from predation and any detrimental environmental changes which in turn can have an impact on the spread of a species.

Achatina fulica is a phenomenal breeder. According to Professor Al Meade an individual snail becomes sexually mature nine months after hatching. That snail can then produce four batches of eggs comprising of 150 eggs to each clutch. If each of the hatchlings survived and successfully bred for a further five years we would be looking at 16,121,432,399,695,050 snails - that is over 16 quadrillion individuals. To illustrate the enormity of this figure Mr Meade makes this point (7)...

“... if we conservatively assume that each individual is 4 inches long and that all the progeny is arranged in a straight line, there would be 15,840 snails per mile for 1.017,767,196,950 miles. This distance would be equivalent to over 2,130,494 round trips to the moon or over 5,477 round trips to the sun.”

That gives you an idea of the reproductive potential of this species. Not all snails are as prolific yet can lay a considerable number of eggs per clutch, and given the right conditions and in the absence of heavy predation, a species is able to colonise new ground previously unpopulated by their kind.

The Rosy Wolf Snail (*Euglandina rosea*) (Ferussac, 1818) is a carnivore - native to the southern east coast of the United States. It was introduced as a biological agent in an attempt to control the spread of *Achatina fulica* in French Polynesia. These snails lay egg clutches of around a 24-35 shell covered eggs, which isn't that many compared to other species. Yet when left to roam (and they are fast for a snail) on the island of Moorea, they spread at rate of about 1.2 km per year.

Predation

Pressures from predators can work for or against dispersal. Certainly when we look at an isolated species we can see how the influence of predation can lead to their success or failure, or in some cases extinction. This is not a world evolving but groaning as the apostle tells us in the book of Romans (8), longing to be set free from the corruption brought through man's rebellion.

We see this powerfully played out in French Polynesia with the success of two introduced species, which in turn led to a rescue mission to save a large genera of endemic species under threat of extinction. The sad story unfolds with the introduction of the species *Achatina fulica* to the Society Islands which colonised rapidly in the absence of heavy predation.

After many unsuccessful measures taken against its advance, biological control was employed in the form of another snail – the carnivorous Rosy Wolf Snail (*Euglandina rosea*) which decimated the endemic *Partula* snails. 50 *Partulids* have since gone extinct with 11 species now kept and cultured in captivity. It is sobering to consider how in the space of 2-3 decades through the introduction of a foreign species we have now lost 50 species.

The return to the Pacific islands for the *Partula* snails in the presence of the predator may not look very promising yet there have been glimpses of success. Wild specimens of *P.hyalina* and *P.clara* have been found alive in the Tahiti (9). Also a special reserve has been built on the island in a national state park in the hope of re-establishing captive bred *Partula* back in the wild.

The banded snail project 'Evolution Megalab' which does not actually observe any evolution(see article), is closely monitoring the distribution of the Grove Snail (*Cepaea nemoralis*). In the UK it will be interesting to see how the decline in the numbers of Song Thrushes and hedgehogs affects their current range and if new areas can be colonised.

Variability

The hallmark of the created kinds is their great variability which powerfully impacts their distribution. Within families we identify species with specific strengths and weaknesses, limitations and preferences which all influence where and how they live.

Islands are a great place to observe this variation. They are not living laboratories of evolution, rather living examples of the great variation in a given kind that can develop in an isolated setting, which of itself can contain a range of environments all bearing on the development of a species.

Henry Crampton studied *Partula* that live on Moorea (an island in French Polynesia) producing some detailed pictures of the many varieties in the kind. Yet he believed that his work like Darwin's on Galapagos might explain how species evolve. Of the 123 different species of *Partula* snails we do not see any evolution whatsoever. What you will find is the great diversity of the genus spread over some 5000 square miles from the Society Islands in the Pacific to Palau highlighting the incredible distribution and variability of this kind.

Because of the asymmetrical structure of some snail shells, they can either coil to the left (sinistral) or to the right (dextral). What is really fascinating to find with these *Partulids* living on Moorea is that *P.mirabilis* and *P.taenata* are right handed, *P.tohiveana* left handed, and *P.suturalis* which lives in the north and south of the island can be both. Those to the north coil left and those in the south coil left. Why is that? It may be that the coiling promotes geographic isolation because the two varieties of *P.suturalis* are prevented from mating with their neighbours allowing species to occupy and colonise new ground. These are great questions to explore. What we do not see is any evolution. What we do see is incredible variation of this kind with over 100 species to count for.

When we consider *Achatina fulica* it is very interesting to see how its own variability enables the snail to survive in many different environments. Ecological factors in the environment can have an effect on the genetic characteristics of a given population of snails, funnelling their variability. Yet this is not a trigger for any evolution at all. We are simply observing how species can use their inherited traits to survive. *Achatina fulica* like other species can be very varied. Some mature specimens can have a shell length of two or three inches, whereas some monsters can grow to just under eight. Some have very thick shells, others thin. These snails are also bred and kept as pets with a variety of shades in flesh and shell colour. Again and again we are seeing the tremendous wisdom of God in creating these creatures that are carefully designed to remind us that each brings forth after its kind covering the continents in dazzling diversity. What we never see and will never see is any evolution.

The Conflict

The conflict we see is not with the facts but with the philosophy which at its roots and all the way to its rafters is a rejection of God's revealed history given in the book of Genesis. No one has seen any snail evolve or the continents drift apart. We have to marvel at how such a process that no one has ever observed powers so much of modern day thinking. As we have seen it is not the case that evolution is a better model, as the facts in the field clearly rest on the foundation of Genesis.

The real question we must ask ourselves is not what is better, but what is true? Charles Darwin had an idea - we have the revealed word of God that clearly reveals to us not just *when* God made the heavens and the earth but *how*. That is the real nature of the conflict. Given the record of Genesis we can actually see how the real character of the kinds has enabled their colonisation in a relatively short period of time and how their development is not an upward struggle but downward and devolving from their post flood forms, with various species hampered by limiting factors to their success and regeneration.

Kept by the King of Kings, Given for Glory

The success of snails is down to God's sustaining power and provision. When you consider the great pressures facing them from predation, pollution and loss of habitat it is a wonder we have any at all. Yet we see in and beyond their marvellous design how God is securing their survival and success. Why? They, like all He has made, are here to declare His glory. This is why Noah was told to bring two of every kind, seven of some to enter the ark. Creation is a living testament which leaves none of us without excuse. Kept by the King of Kings, given for glory – that is the cry of creation from the smallest, all the way to the greatest of all that He has made.

Special glory is set apart in mankind whom God made in His own image. It was for man who bears that glory that Noah set to build the greatest ship of all time in order to rescue him from the great judgment that was to come upon the earth. But then we have to marvel at the marvel of marvels, for it was through this rescue plan that God was to enter the world in the person of Jesus Christ of Nazareth to provide redemption for fallen humanity. Man was kept by the King of Kings for the King of Kings Who would later lay down His life and open the way back to God. What an incredible picture we see unfolding. And even today, man is still kept by that sustaining power, that he might repent (change his mind) and believe on the Lord Jesus Christ and be saved from the wrath to come.

Dear reader is that true of you?

Have you responded in repentance (a change of mind) and faith towards our Lord Jesus Christ? We were made for His glory and only through Jesus Christ can we be redeemed from the ruin that our sin is making of us and avoid the punishment of hell that our sin so deserves. God though is not willing that any perish but that all come to repentance. That is why we are kept in this broken world, that we might come to know Him Who is life eternal through repentance and faith.

Therefore we must give the more earnest heed to the things we have heard, lest we drift away. For if the word spoken through angels proved steadfast, and every transgression and disobedience received a just reward, how shall we escape if we neglect so great a salvation, which at the first began to be spoken by the Lord, and was confirmed to us by those who heard Him, God also bearing witness both with signs and wonders, with various miracles, and gifts of the Holy Spirit, according to His own will?

Hebrews 2:2-3 (NKJV)

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