

Kerala's Wetlands and Holocene Climate

A JANAL Talk by Dr Jenée Peter

Summary: *Over the past 10,000 years, Central Kerala has been a canvas for climate's subtle brush strokes. The emergence of dunes signifies drier periods, while the wetlands mark wetter ecosystems. Kerala's residents forged remarkable strategies as they adapted to these ever-changing climatic shifts.*

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In the Holocene, we see the end of the Ice age and the beginning of a warmer period. This is a period when we have human presence and histories, and we start with the Paleolithic, move on to the Mesolithic, the Neolithic, and then move to the Metal Age. In the case of Kerala, we have the Iron Age, the megalithic and all coming up. However, the culture change is not linear, there are a lot of parallel events happening. Some of these earlier cultural adaptations will last for a very long time, and the change might be very slow. If we look at the entire history of the Earth, which is 4.6 billion years, this is less than 0.01% of the geologic time.

A Warming World and its Impact

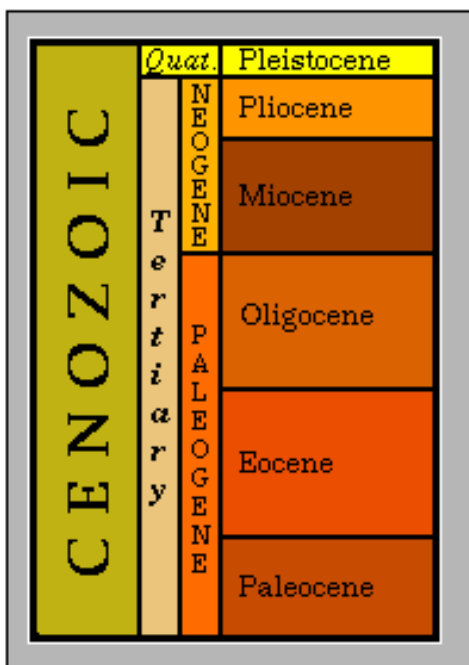


Figure 1. Subdivisions of the Cenozoic Era.
Image: Janal Archives, 2024

The Holocene corresponds with the rapid proliferation, growth, and impacts of the human species. The International Commission on Stratigraphy has defined the Holocene as starting approximately 11,700 years before 2000 CE. The optimum of this climate condition happens maybe from 7000 BCE to 3000 BCE, This was followed by a gradual decline in temperature until about two millennia - 2000 years ago. So we have three different climatic levels, but all of them are warmer and it was warmer than the present. But the difference now is the rate at which the warming is happening is accelerated. We are still in the Holocene and witnessing a warmer period and it was preceded by the ice age, so we have the cyclic warm, cold, warm that happens and within each, you will again have smaller cycles. So there is a kind of a cycle that means you start, then you go to the peak and then you have to come back down again. This is how we have to comprehend the most defining thing in our life - climate, its influence on our environment, and how it translates into a cultural record in a site or a region.

Now there are many models by which we can look at this. There are traditional models by which we will be looking at one particular aspect and think that is the most important reason for a culture change. Archaeology usually deals with understanding the change in cultures, why larger areas, at the Arabian Sea, or the Indian Ocean, as when we talk about

monsoon, which is one of the most defining aspects of our climate. However, looking at a very large area may not get results or data that can supplement what happens on the ground. So by taking smaller regions, and smaller units to work, based on some defining environmental features.

Kerala - A Land Shaped by Water

For example, today we learn that there are 44 rivers in Kerala. At the beginning of the Holocene, rivers and the number of water bodies were more, showing that there was a wetter climate. The warmer climate typical of the Holocene period doesn't mean it cannot be wetter, the monsoon is there, which means we have gotten numerous water bodies in the early Holocene, in the mid-Holocene and towards the end, we know there are 44 major rivers.

Paddy fields in Kerala have a meandering feature. but since fields do not meander, it is the flowing river that meanders, and in particular in the middle course of the river - and Google map images show this. So in parts of Kerala where there is very undulating terrain with higher ground like hillocks, and when we go up to view the landscape, this feature will be very clear. That means that many of these were Paleo-channels, i.e the channel of a former river, so we are looking at ancient riverbeds.

Our study started with this observation, looking at one particular culture that is the Iron Age in Kerala. We were looking at that, but saw this unique feature: an ancient dry river bed. Now, it so happens in history, there are records for ports and sites, but we don't find actual evidence on the ground. So we asked ourselves if we were looking at the right place. Our settlements are defined by rivers. If we are looking at a 2000-year-old early historic port, then we have to look at where the river was flowing 2000 years ago. Often what happened was that we were looking at the present river and then hoping to find something which is 2000 years old or more.

So understanding the ancient land use and landscape is very important in understanding the past cultures, and are extremely significant and crucial in a place like Kerala. We got a bit more clarity after the 2018 Floods, because all of the land changed in front of our eyes. So in certain parts of the Periyar river course, we went and interviewed people living close to the river after the floods. We heard them say their houses have been witness to earlier floods, and could show silt deposit lines of previous floods, whether major or minor, in the 1960s, or the 1980s, and in that way the houses give the entire flood history. We saw that a lot of silt was deposited almost in the middle of the river in Thottumugham in Aluva. The place name, 'thottu' (a small stream) and 'mugam' (mouth), meaning small stream or tributary which joins at the

mouth of a river, provides a lot of clues in the name itself. So, in that region a lot of silt was deposited, and the rivers flowing in one direction shifted its course because of the siltation.

A major flood has been documented in the Periyar once in a century, making the river shift like this. In a 1000 years, this happens 10 times. So the river course, which is here now, a 1000 years ago was there perhaps, but to verify this model we need evidence. We need to dig cores, trenches, so that's why we decided to go as a team to this field. We started from the present river and its different channels. While we were there, as we were moving along the National Highway, we could see a lot of dredging taking place because of the National Highway extension. For each pillar, they have to take a sample of soil and rock, a geologic sample. All these samples, this data is now easily available above the ground, so we could use it to arrive at the entire geology history of this region. On closer examination of the samples, we saw peat deposits which help us to understand the past vegetation, and in turn that tells us a lot about the climate. Also, radiometric dating, absolute dating, is now possible by dating of the minerals. More radiometric dating techniques like OSL dating are planned for further exploration during the dry season.

Now, this was on the outskirts of Ernakulam in the Paravoor region, so we

looked closer to the town. There are small streams and dry riverbeds everywhere, and when we normally move from one place to another, we see many small bridges and water bodies. That means in an earlier period before the bridges were built, there were clearly defined natural boundaries. And so, if we imagine that period before modern infrastructure arrived, it is possible to understand how people would have lived in this region.



Fig 1: Arattu Kadavu Bridge, Ernakulam

Beyond the Surface: A Deeper Look at Polished Stone Axes

In the second fieldwork, we looked at agriculture, at the origin of pepper and rice cultivation, and hinterland - maritime connections. We moved up the river along the Periyar, close to Kalady, to a small village called Mekalady further away from it.. 'Mel' means "on top" or "higher" in Malayalam, so the place name gives a clue that it is an "upland" or "highland" place. The river nearby is called Toodu (small river), Kottamam toodu.

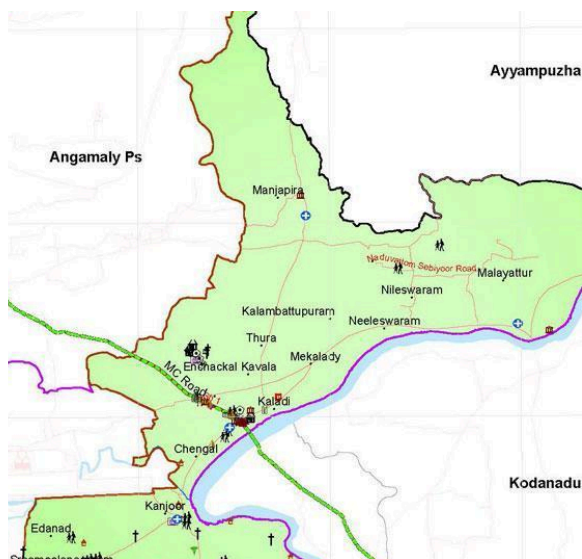


Fig 2: Map showing Mekkalady

This place is significant in Kerala history due to the discovery of a large collection of polished stone tools over the past two decades. These have been collected by one person, a local resident of this place, who has been collecting many artefacts almost daily from the Toodu, but the most important of these are the polished stone tools. Most of them are in his care, in a private collection, and some of them he has donated to a government Museum in Thiruvananthapuram. The question of interest to us was, where did the polished stones tools come from? The primary context of these artefacts remained a mystery.

At the site in the Toodu where he collected the stone axes, we were deep in a river terrace. There we understood how sand mining of the riverbed was digging into the riverbed and at some point, it reached an

earlier layer of the river and exposed these stone axes, and every day our collector went there, he could collect more polished stone axes. The question became, why are we finding these tools only from here, and why do we get this? The polished stone artefacts have clearly travelled from somewhere else and been deposited here. This is not their primary context / location, because the water has carried it downstream from their original location. That was our first hypothesis because many teams are still working on it.

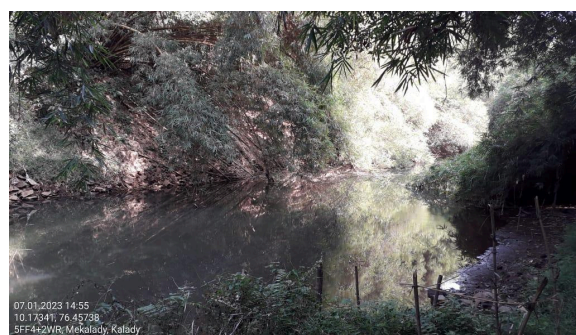


Fig 3: Mekkalady River

The next question was the raw material used to make these stone axes. Dolerite, a type of rock, was identified, and though it is not common in the area, geologists indicated that there are dolerite dykes in the region. This finding points towards a group of people who knew the land well, recognised its different types of rocks and stones, were aware of cutting and polishing for enhancing aesthetics, and knew where to find the rock types that could be polished and made into an axe. So, it is clear that the community had

sophisticated knowledge of different rock types suitable for toolmaking.

Of greater interest is the fact that the polished stone tools were found at the end of a small river, a mere 25 kilometre long stream or 'toodu', coming down from the highland before it connects with the Periyar river.

An intensive exploration of the Ayyampuzha plantation region looking at the region along the course of the 'toodu' could hopefully help in understanding why the largest collection of polished stone axes in Kerala come from this region. This is not about one or two occurrences over almost 200 years from various places, but a unique find. In addition, finding the grinding stones also indicates that the polished stone axes were not just kept for use here, they were also made here. By finding the grinding tools, evidence of the making of these polished stone axes, makes the site become significant, as the site may have been a polished stone tool factory in prehistory.

Living with Floods: The Rise of Elevated Houses

Another thing that caught our attention was this collector's more than 100 year old house, his Tharavad on a mound. When we went down to the river, the water was almost five to six metres lower. And on top of the mound, in order to get inside the house, you have to climb six steps, each

one foot high, making the floor of the house six feet above the ground. Inside the house, there is another small attic kind of setup at the roof of the house.

Replying to our questions about the peculiarity of the house, the collector said the construction style was because of the danger of recurrent floods. Clearly, a century ago, we were sensitive to these aspects of site-planning and construction. We did not build houses in the 'Nilam' land (wetland), instead a separate word 'purayidom' (dryland) indicates there's a special place which is a high dry ground, which is marked to build a house. In an ecology of wetlands where there are few patches where to stay dry, it would explain why there is a scarcity of land to build a permanent house. Could it be possible that this be one of the reasons why we were not having nuclear households, but were having joint housing units. This could be a response to what was the land and climate condition around us.

Wetlands, Drainage, Agriculture and Human Settlements

When we move to Kakkanad in the heart of the city, there is a lot of digital technology available, for example Google Maps can tell us a lot before we even go to the field. When we were looking at a Google Map of Kakkanad, we saw a lot of built structures in one place, and wondered why there are no structures not too far away. These

unbuilt sections of land are the wetlands, the marshy land that remains, while the rest of it has been levelled, raised and we have started building huge constructions on the. There are so many flats coming up, so there is lots of dredging happening.



Fig 4: Aerial view of Kakkanad. The red line marks the remaining wetlands.

So, after finding these records about the 'ground', we can go to the field sites and do a preliminary investigation or an exploration about such a wetland. A geomorphologist gives a number of reasons to explain how wetlands are created, and one of the simpler reasons would be constant wet conditions. So, when there is too much water, beyond the carrying capacity of that particular river or water body, silt deposits would seal some of the places where the water could flow. So, once the water is not flowing, the water is stagnant, these places gradually evolve into these wetlands.

As far as human settlement is concerned, the wetlands could be one of the places

where a lot of possibilities exist for the origin of agriculture or farming. In many places in South India, we talk about irrigation for cultivation, whereas, in a wetland, we have to think the other way around. We need to think about excess water and the need to drain the water. So, we drain water from some of the water bodies or the wetlands and then it can be ideal for rice cultivation. Now, this rice cultivation could be done in two ways: one could be broadcasting the seeds and the other one would be transplanting the rice. So, transplanting means you have another place where you will first germinate it. and then you have these seedlings which you would plant again. This is ideal for you know, higher yield, when you will need more regular, standardised, grid like fields. But, the aim of early agriculture was to grow enough to live, to subsist, hand in hand with other gathered and hunted / fished food, and this made early agriculture a subsistence strategy. Early farmers did not look for heavy technology. After the floods, an alluvial silt deposit accumulates, which is very fertile. Even if you just broadcast some seeds, you will get a good yield even perhaps, to some extent of surplus. So, that is one possibility of the early origins of agriculture in wetlands during the Holocene.

So, instead of looking for evidence of irrigation in wetlands, like tanks in Tamil Nadu, we should be looking for something opposite. At how this draining of water can

take place, and what the techniques used for the draining of water. For example, before the rains every year, dredging of watercourses and channels takes place to prevent floods, so that as much rain water as possible can flow away, this is what every Panchayat or every municipality will do.



Fig 5: A wetland in Kakkanad

So here, this entire wetland has water underneath, just that there is some plant growth, sediment and over-growth on top of it. During one dredging, the excavator used to dig out a peat deposit from here in a wetland in Kakkanad. We will wait for the dry summer season, when this peat deposit will be studied, analysed for residues and given for OSL dating. So, that way we will be able to date the conditions here, and understand the ecology and the climate of the time. So we will be able to understand the prehistory of this place, today one kilometre from the Thrikkakara civil station. This kind of study is not something that we

have to do far away, we can literally conduct research in the backyard.. So, that is another revelation that takes place when you're dealing with these kinds of studies in Kerala.

History- an Interdisciplinary Method

So, we have looked at three different regions, the samples we have collected and what can be done with it. This is just the beginning of these kinds of studies in Kerala. So, we will have to move very cautiously and have to wait for more studies and more data.

Something interesting that I would like to share is the discovery of a ring well at a place in Kodungallur in Thrissur district. So, we went there and we found that we were standing on a dune. Dune is something that we think of in the Thar Desert. If we study Gujarat we know that some Mesolithic settlements were on stabilised dunes, but I had never come across the suggestion of Dune in Kerala. But then we happen to find evidence for it in three different localities.

So what I'm trying to say is we have to keep our eyes and ears open. And then we would see things that you could expect. So, at the next two sites we observed that the dunes were 2-3 kilometres from the Arabian Sea. On one side you have the cannoli canal, and the other side is the Arabian Sea, and in between you have a highly raised ground. This place has got archaeological sites of different periods, from Iron Age, to early historic, early

mediaeval and modern. So that is another possibility that we can look at and I'm sure this will redefine the way we understand the history of Kerala, particularly the early history of Kerala.

Thank you.