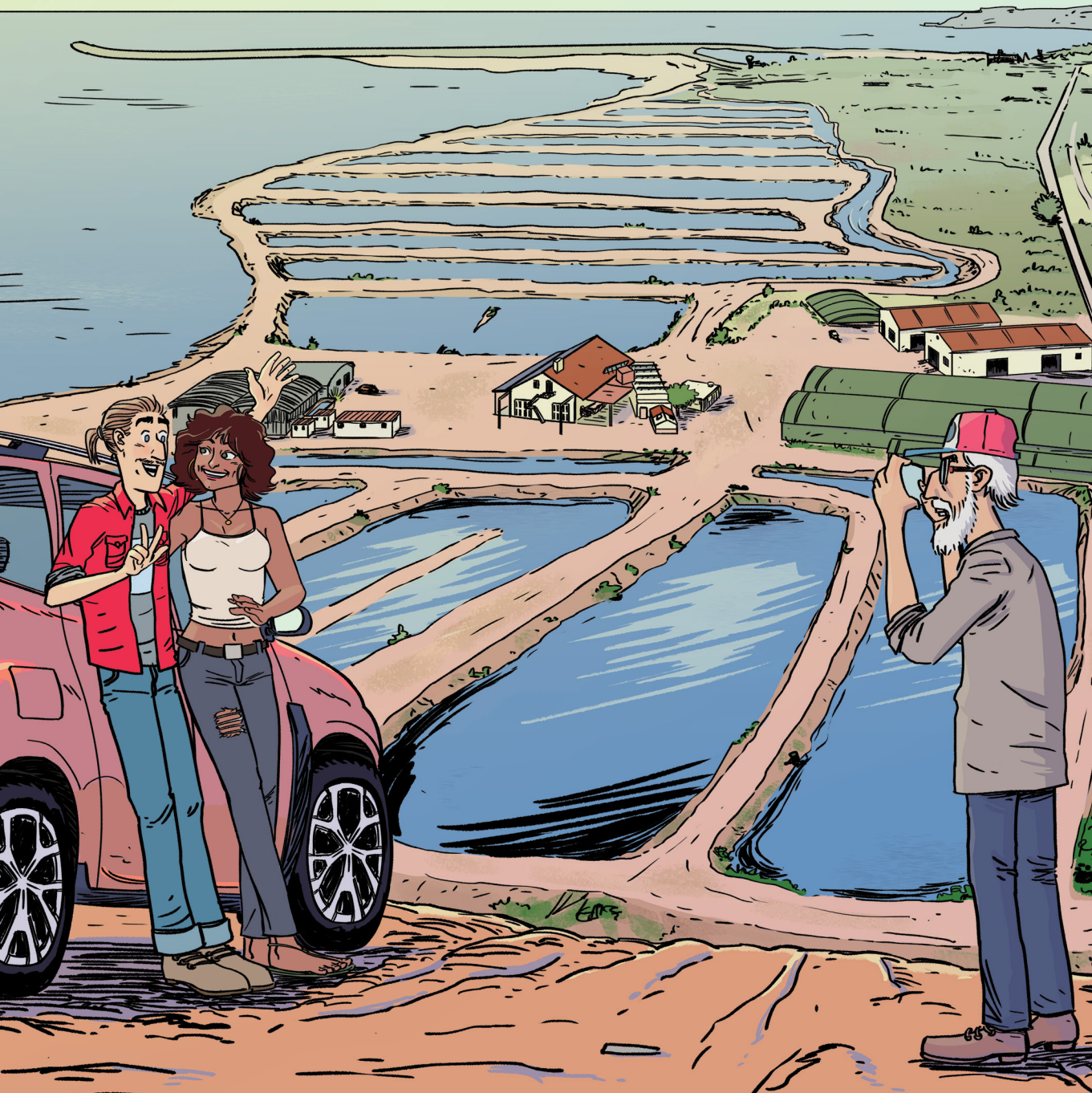


BRUNO PINTO

QUICO NOGUEIRA

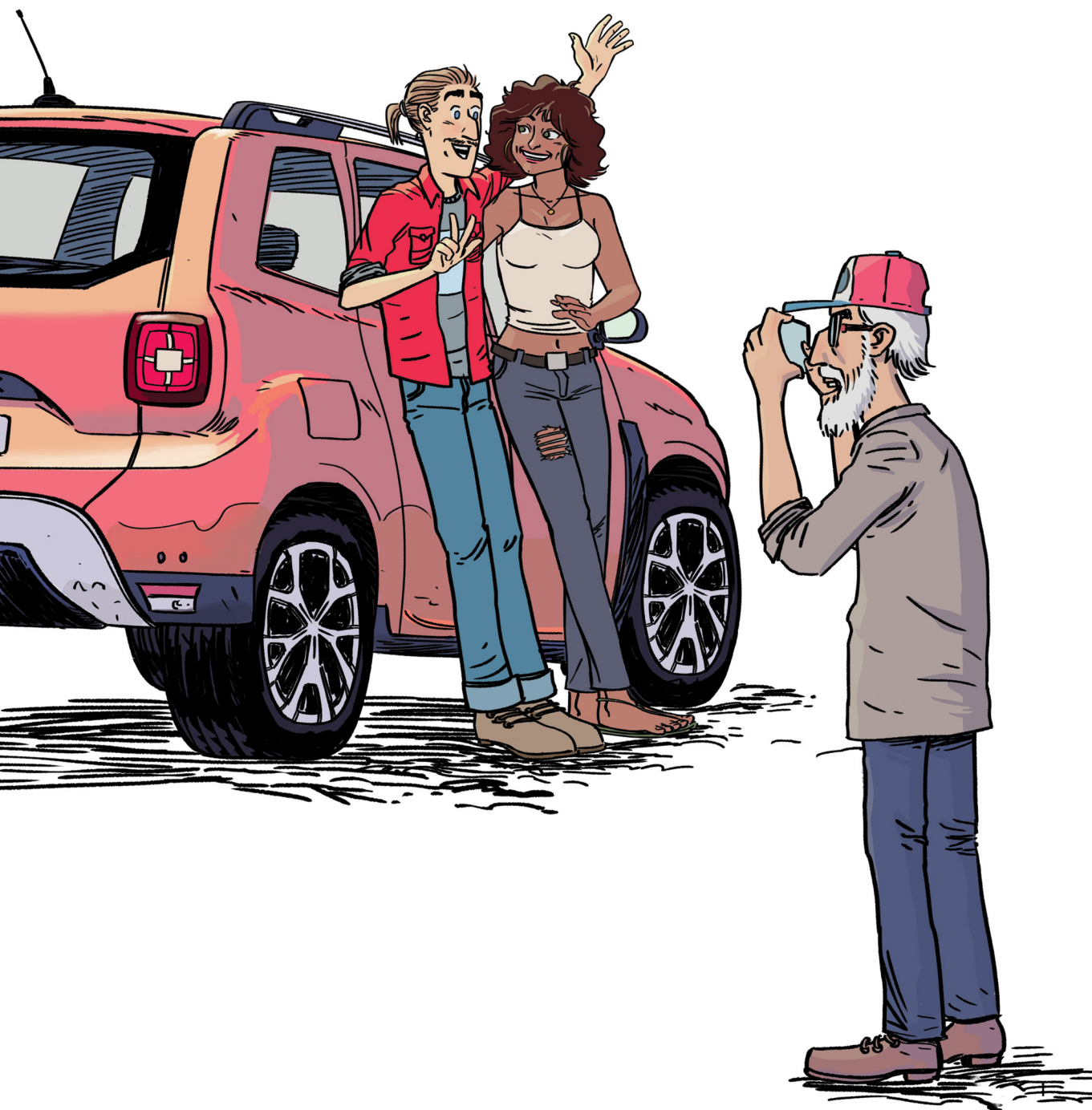
# THE PATH TO THE AQUACULTURE



BRUNO PINTO

QUICO NOGUEIRA

# THE PATH TO THE AQUACULTURE





Title: The path to the aquaculture

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AZA4ICE



## FOREWORD

It would be hard to imagine our diet without fish and, thus, their global demand continues to rise. However, threats such as overfishing, and climate change jeopardize the survival of aquatic resources. In an extreme scenario, these threats could even lead to a worldwide depletion of fish stocks.

Therefore, aquaculture has become a vital complement to fishing activity, experiencing the highest growth rate among animal production sectors in recent years and providing healthy and safe food. This development is the result of integrating scientific and technological advances, as well as the efforts of many researchers. Across the globe, these scientists have been studying species and production methodologies within the context of environmental sustainability, thus ensuring the future of aquatic resources.

To increase self-sufficiency in quality seafood and secure food safety, European policies have promoted the growth of aquaculture production. Despite these production incentives, aquaculture remains one of the lowest globally (accounting for approximately 1.1% of global production in 2019). Therefore, the European aquaculture sector needs to continue growing to better meet the needs of its citizens. This growth should adhere to certain principles, including ensuring the nutritional quality of products, guaranteeing animal welfare, and promoting good environmental standards. The challenges are significant for the aquaculture sector, which has sought to adapt and innovate through production systems with an ecosystemic approach and a perspective of circular economy.

Another major challenge for the sector is overcoming the low consumer acceptance of aquaculture products, despite its status as an ancient activity! Currently, few people question whether the meat they consume comes from hunting, but many still have doubts about fish. While hunting is no longer a part of everyday life, fishing still is. This can complicate choices, as only some people are familiar with the concept of aquaculture. The less familiar one is, the more likely they are to distrust the activity due to a lack of knowledge about this form of animal production.

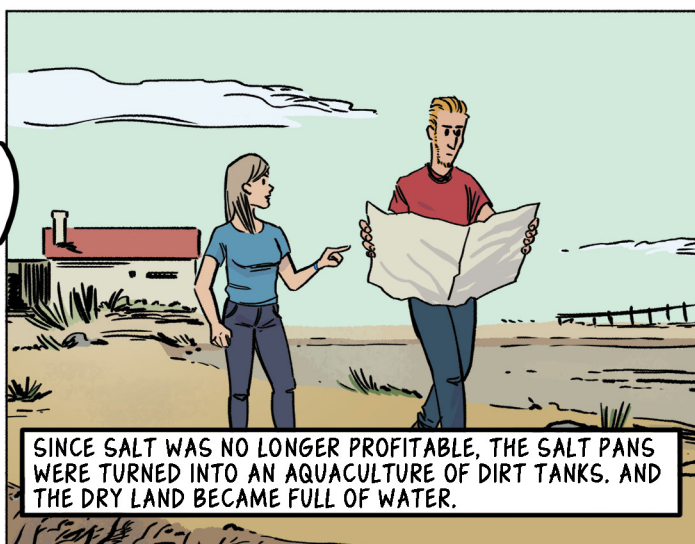
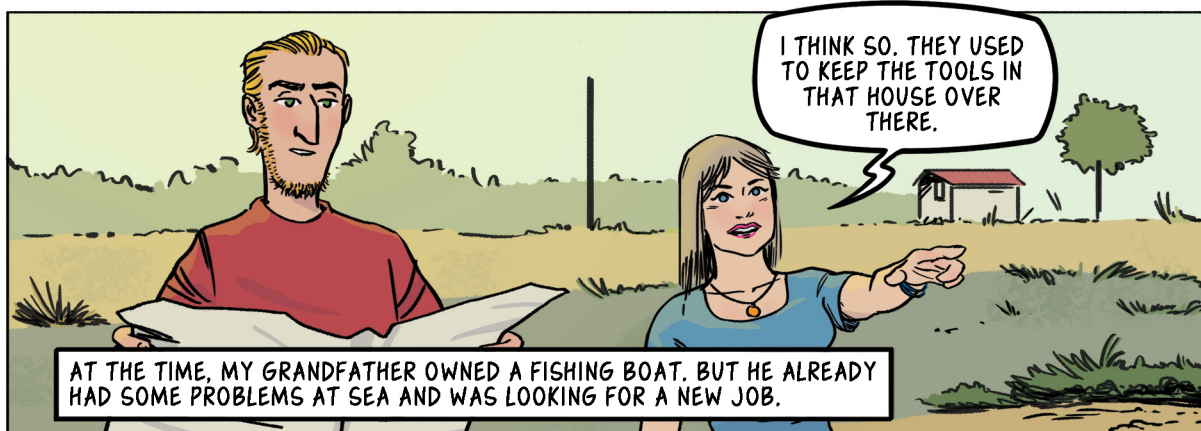
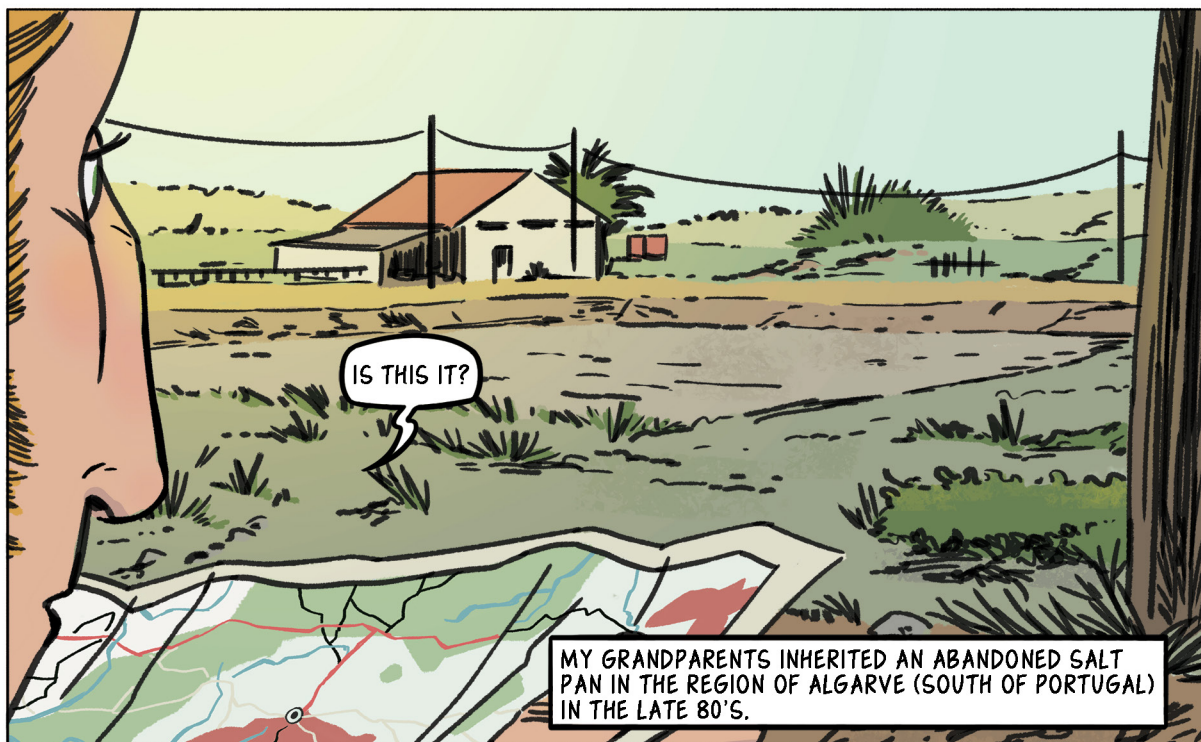


Therefore, it is important to provide information about aquaculture production, the different production systems, the good practices required for species cultivation, and water quality care, among other aspects. The key is to equip consumers with clear and accessible information to facilitate choices and decisions. It is widely acknowledged that a picture is worth a thousand words; multiple and complex ideas can be conveyed through a single image, making it a more effective way to disseminate the message than a mere verbal description. Thus, comics seemed like a good platform to explain what marine aquaculture production is.

The comic book "The path to the aquaculture" tells the story of how aquaculture has developed and consolidated, in this case in the Algarve region (South of Portugal). Above all, it addresses the sharing and transfer of intergenerational knowledge, represented by grandfather Jorge and grandson Filipe. In the book, the grandfather owned an abandoned salt marsh since the late 80s and had the vision to turn it into a fish production ponds, employing very simple techniques, such as restocking juveniles and adding feed. The grandson is a biologist, and while he has acquired scientific knowledge in university, he lacks practical experience, specifically in managing and handling an aquaculture operation. However, his education allows him to propose technological improvements to be introduced, such as multitrophic aquaculture, and the implementation of control and automation mechanisms, thus enabling him to continue the family legacy.

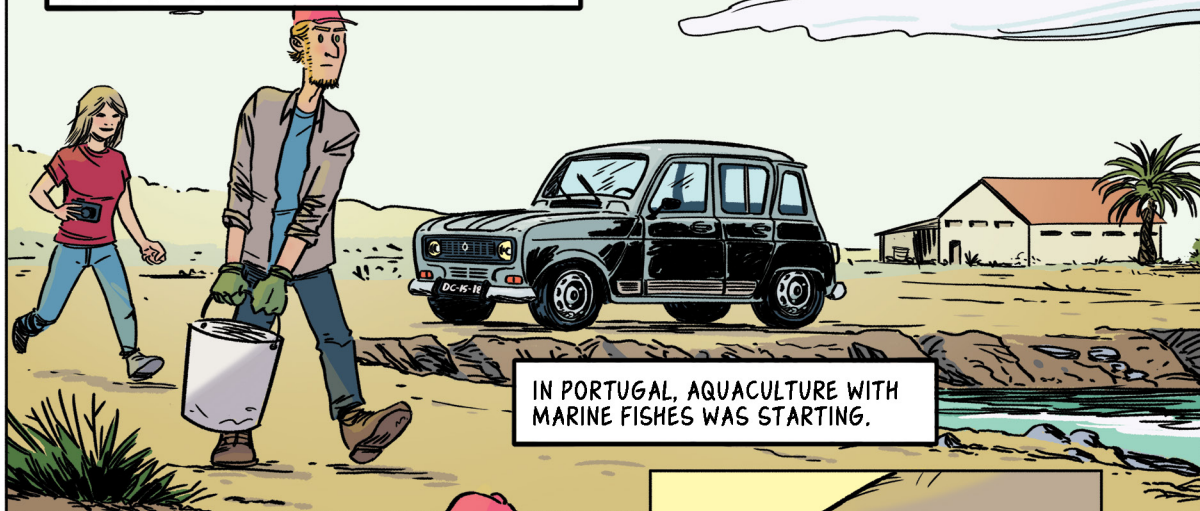
This book tells a story that spans more than thirty years of aquaculture in Portugal but, above all, it is a story of a family, one of many aquaculture families. Starting with very simple production models, and therefore with low production per hectare, they transformed this sector into a successful industry through the introduction of new production technologies, which are now being explored by the more qualified new generations.

**Maria Teresa Dinis**  
Emeritus Professor  
Universidade do Algarve





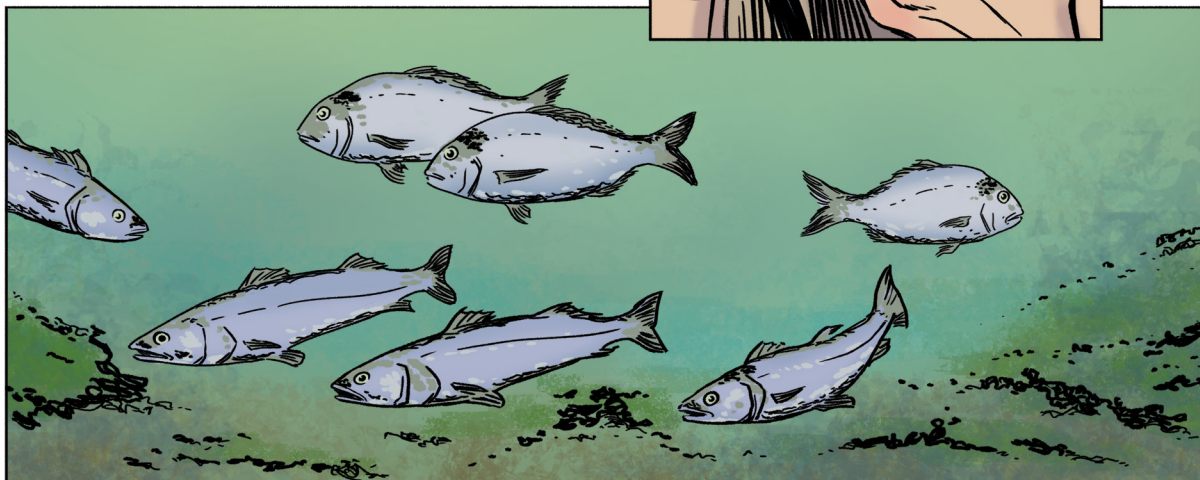
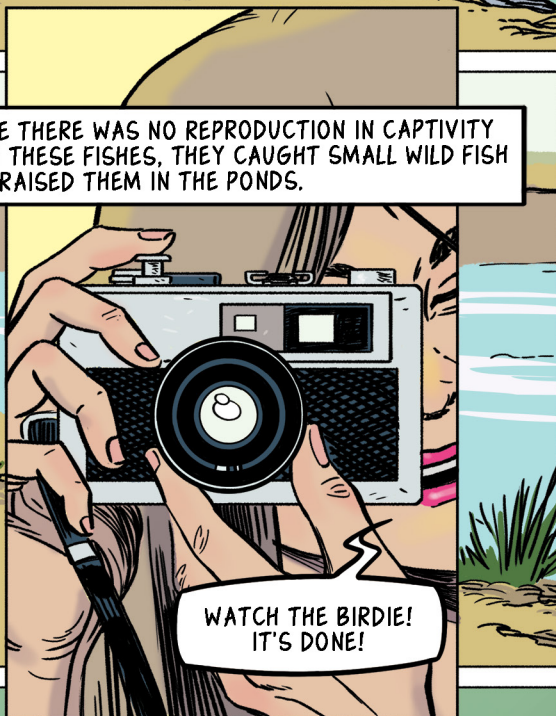
MY GRANDFATHER STOPPED FISHING AND SOLD THE BOAT, TO HAVE MONEY TO INVEST IN THE AQUACULTURE.



IN PORTUGAL, AQUACULTURE WITH MARINE FISHES WAS STARTING.



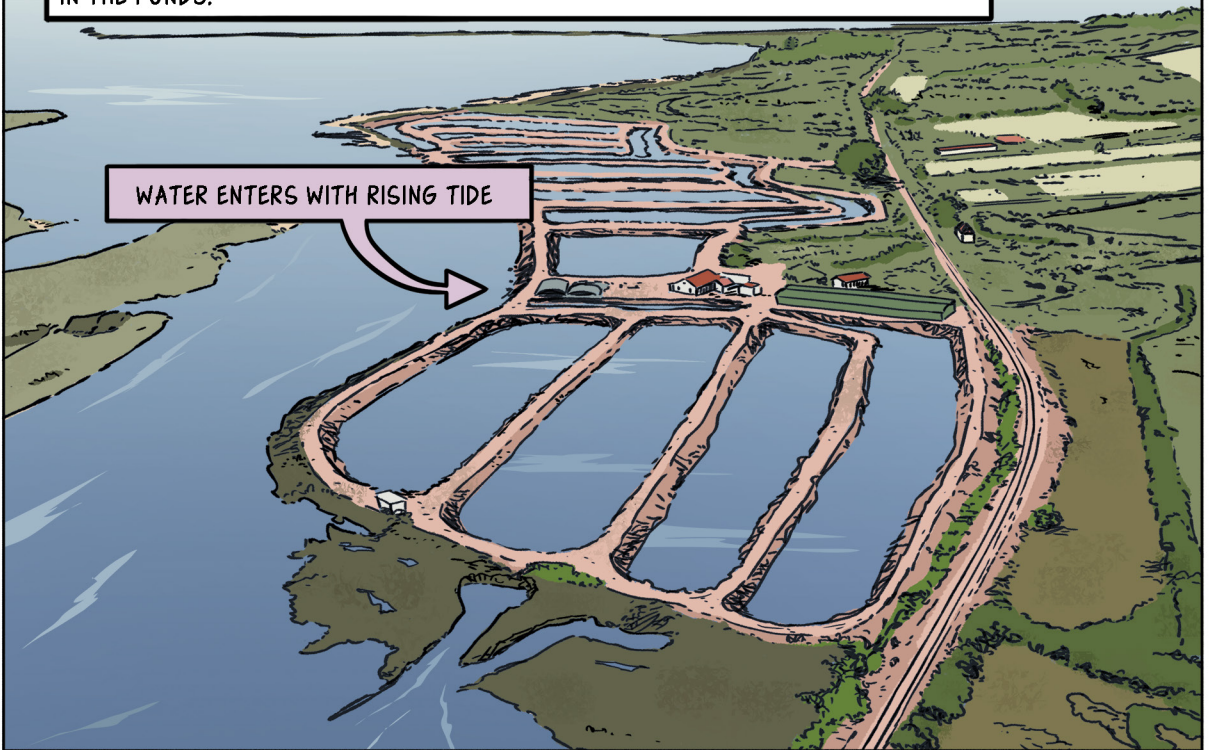
SINCE THERE WAS NO REPRODUCTION IN CAPTIVITY WITH THESE FISHES, THEY CAUGHT SMALL WILD FISH AND RAISED THEM IN THE PONDS.





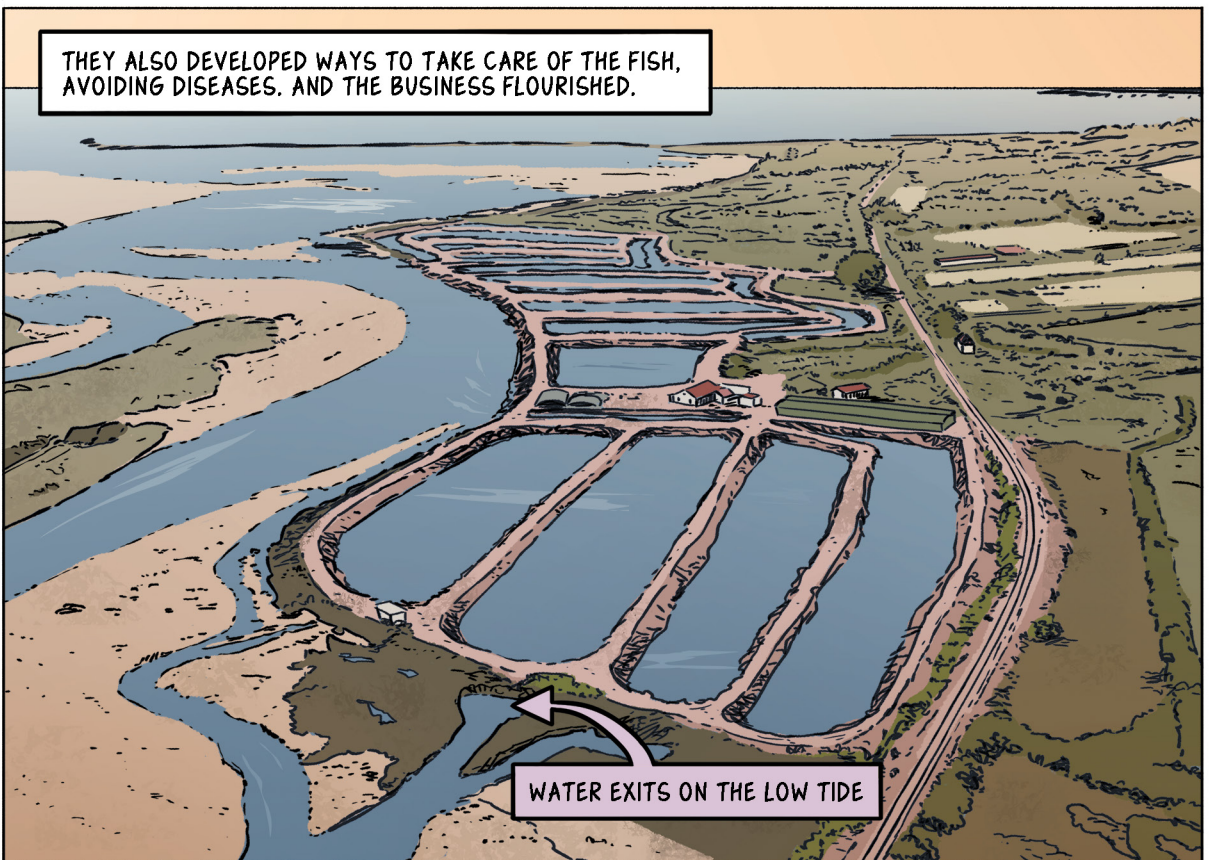
THEY LEARNED HOW TO MANAGE THE WATER FROM THE ESTUARY THAT CAME IN AND OUT EVERY DAY WITH THE TIDE. THIS WATER ALSO BROUGHT LIVE FOOD FOR THE FISH IN THE PONDS.

WATER ENTERS WITH RISING TIDE

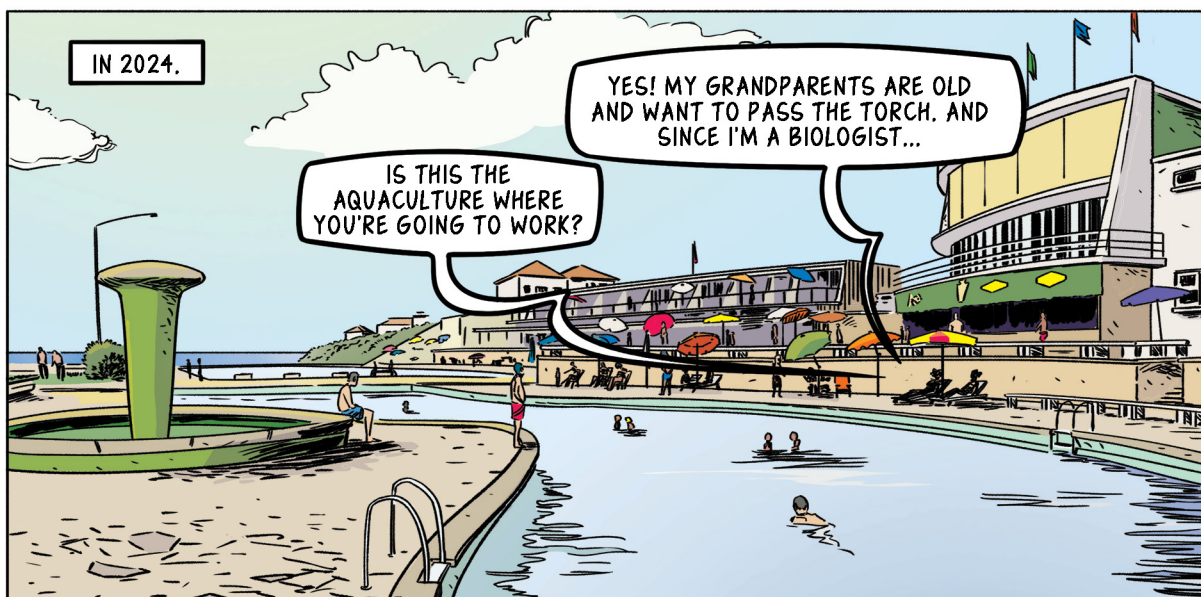
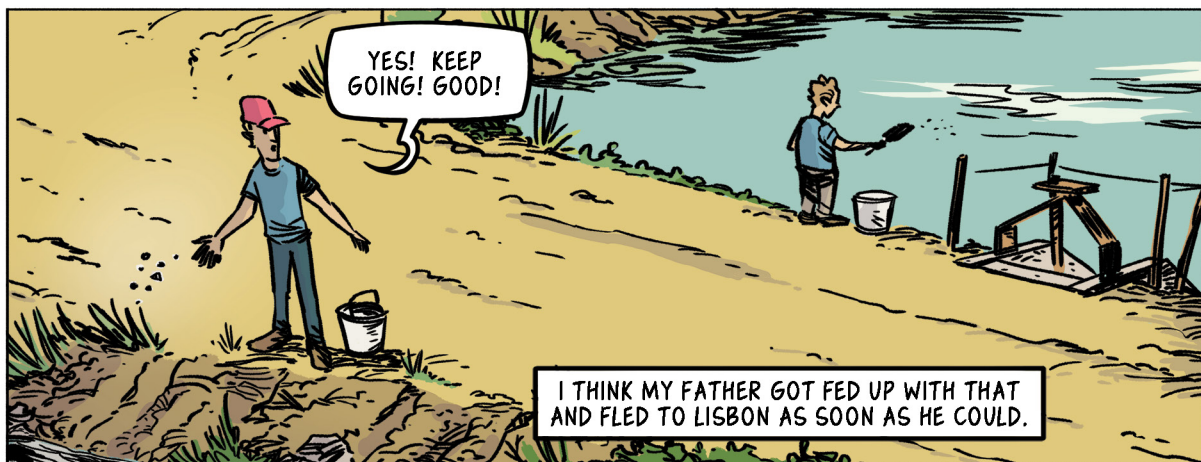
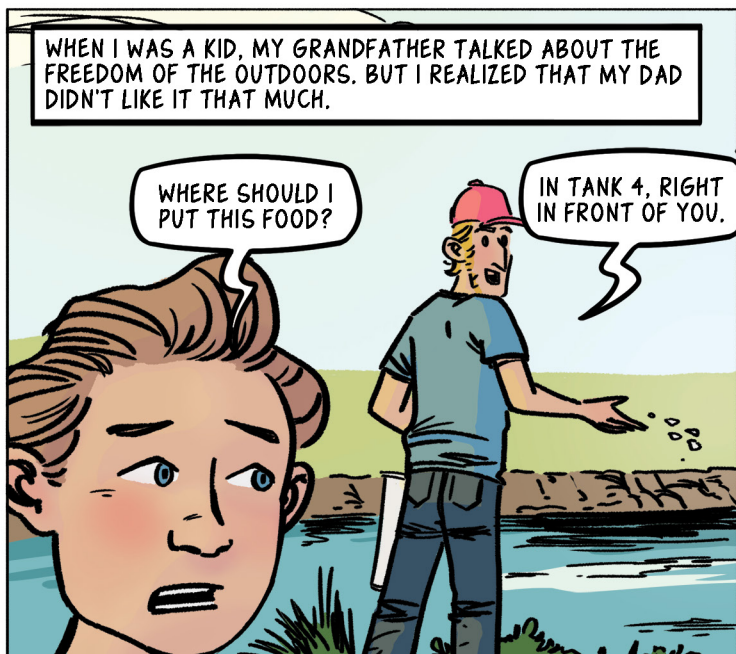


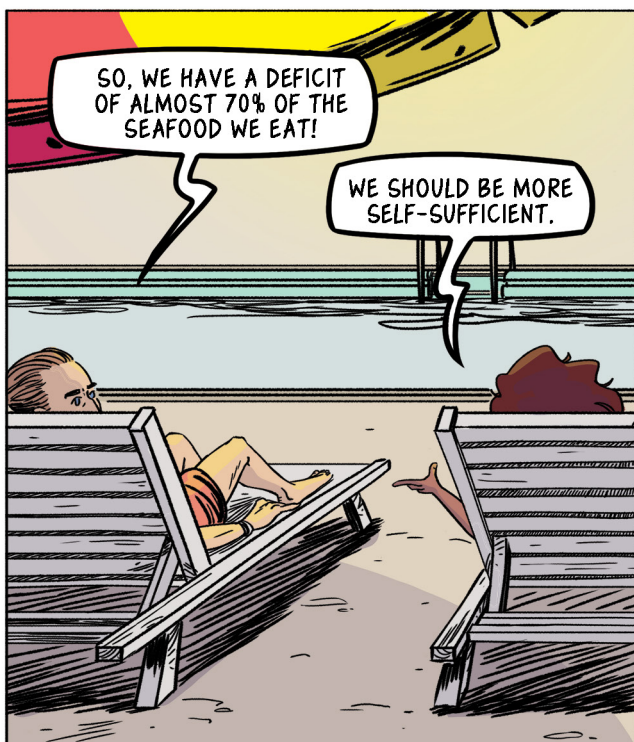
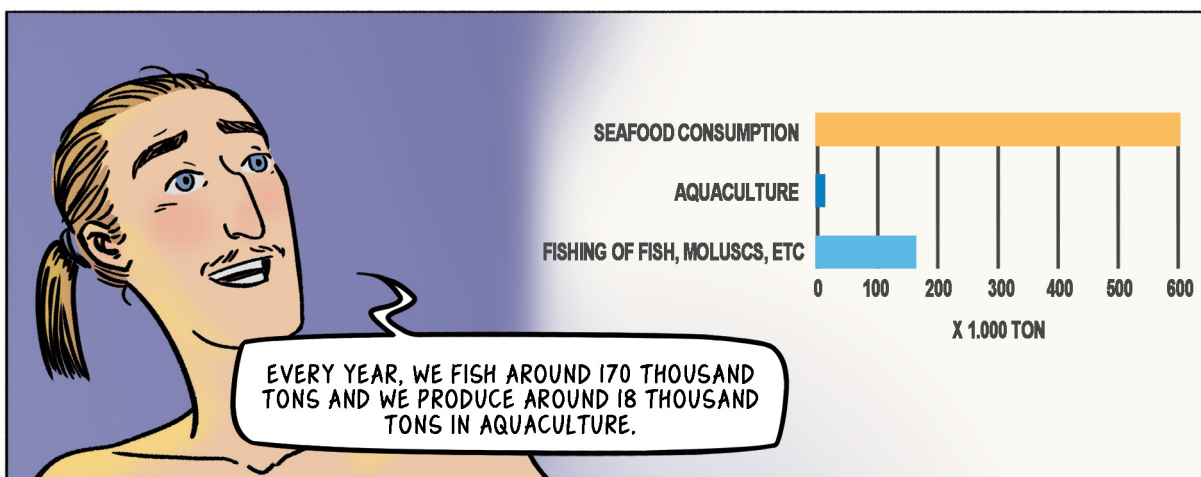
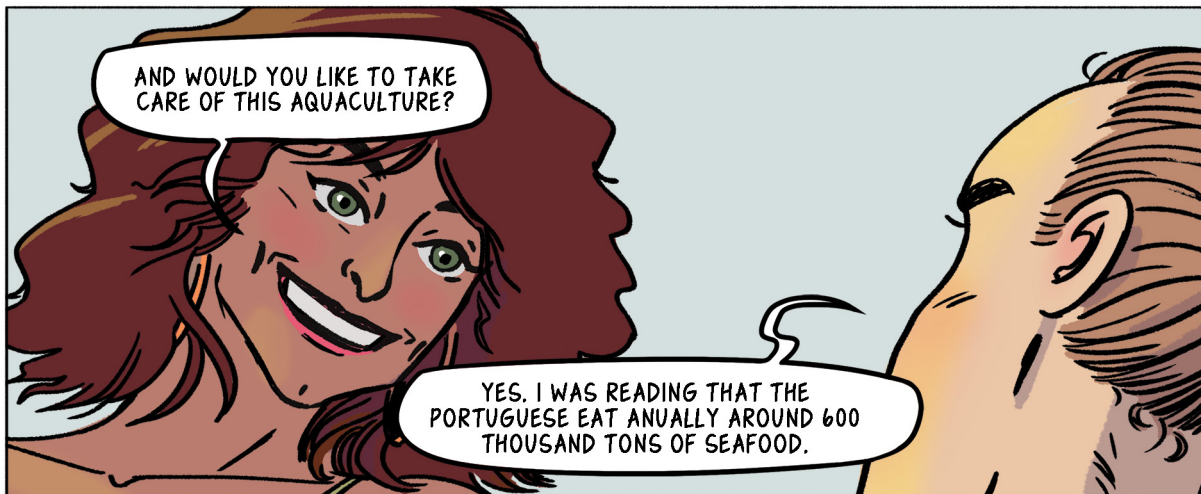
THEY ALSO DEVELOPED WAYS TO TAKE CARE OF THE FISH, AVOIDING DISEASES. AND THE BUSINESS FLOURISHED.

WATER EXITS ON THE LOW TIDE





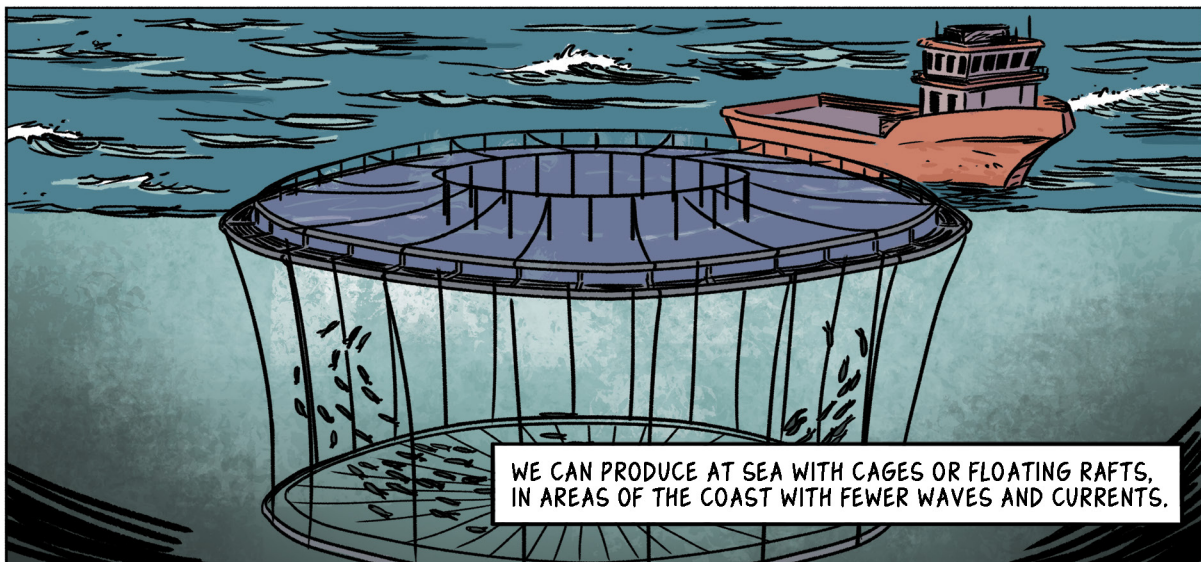






AND IN PORTUGAL WE HAVE GOOD  
CONDITIONS FOR AQUACULTURE?

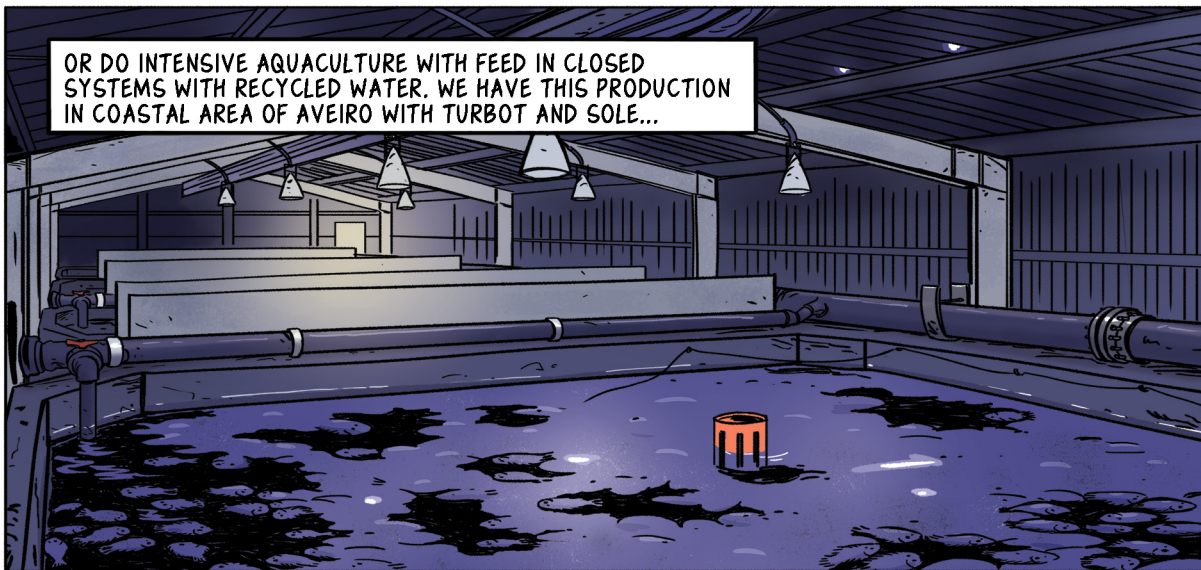
YES. WE CAN USE THE LAND CLOSE  
TO THE COAST USING NATURAL FOOD  
AND FEED, LIKE MY GRANDPARENTS DO.



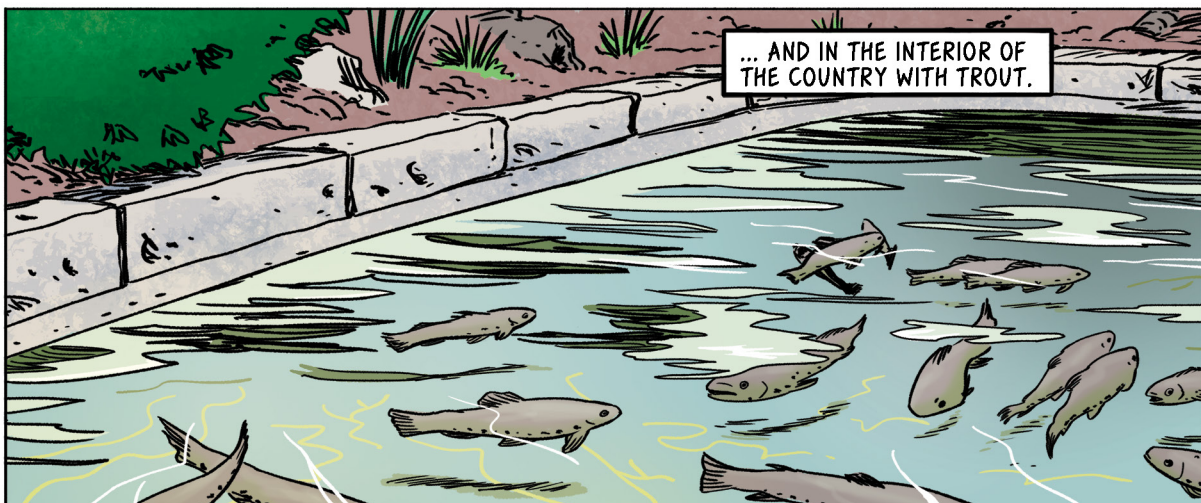
NOT ONLY FISH, BUT ALSO  
MUSSELS OR OYSTERS.



OR DO INTENSIVE AQUACULTURE WITH FEED IN CLOSED SYSTEMS WITH RECYCLED WATER. WE HAVE THIS PRODUCTION IN COASTAL AREA OF AVEIRO WITH TURBOT AND SOLE...



... AND IN THE INTERIOR OF THE COUNTRY WITH TROUT.

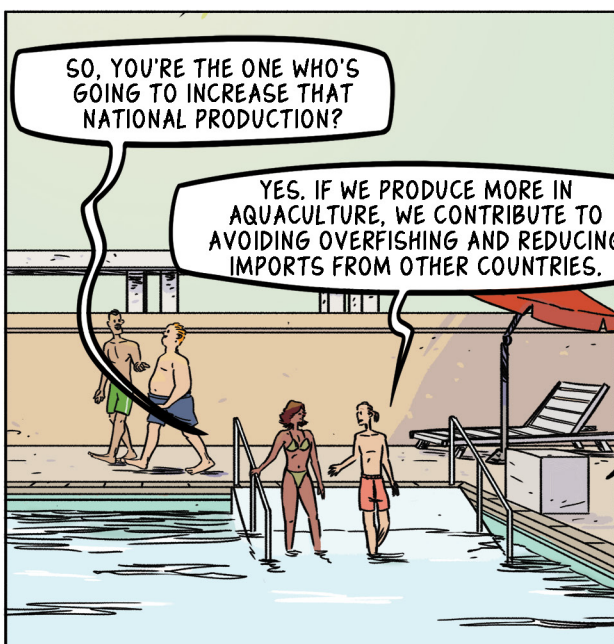


SO, YOU'RE THE ONE WHO'S GOING TO INCREASE THAT NATIONAL PRODUCTION?

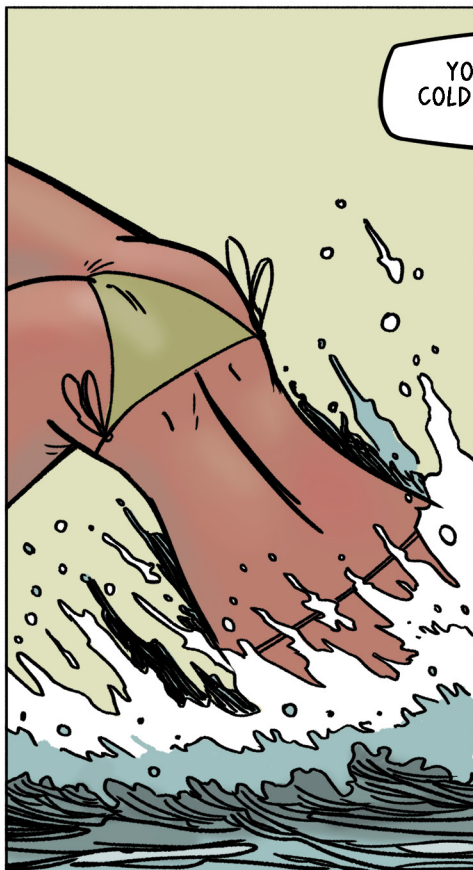
YES, IF WE PRODUCE MORE IN AQUACULTURE, WE CONTRIBUTE TO AVOIDING OVERFISHING AND REDUCING IMPORTS FROM OTHER COUNTRIES.

IN SOME REGIONS, WE ARE AT THE LIMIT OF WHAT WE CAN FISH SUSTAINABLY. SO IT'S GOOD TO HAVE ALTERNATIVES.

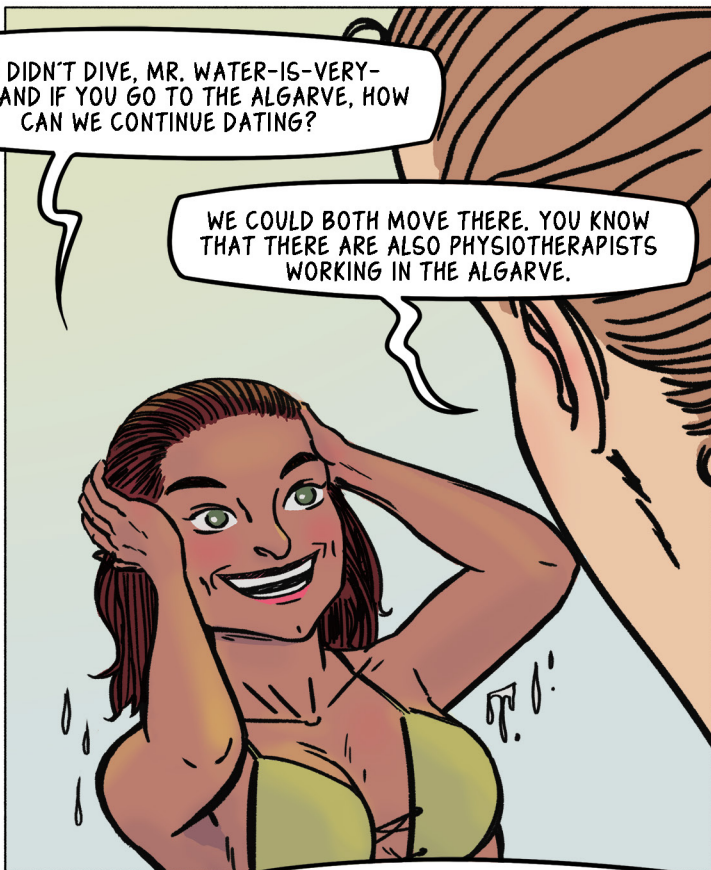
OK... SEE YOU UNDERWATER!







YOU DIDN'T DIVE, MR. WATER-IS-VERY-COLD! AND IF YOU GO TO THE ALGARVE, HOW CAN WE CONTINUE DATING?



WE COULD BOTH MOVE THERE. YOU KNOW THAT THERE ARE ALSO PHYSIOTHERAPISTS WORKING IN THE ALGARVE.



FOR NOW, I WOULD LIKE YOU TO VISIT. EVEN BECAUSE YOU'LL MISS ME A LOT...

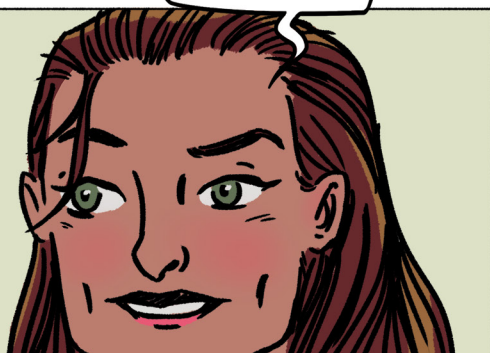


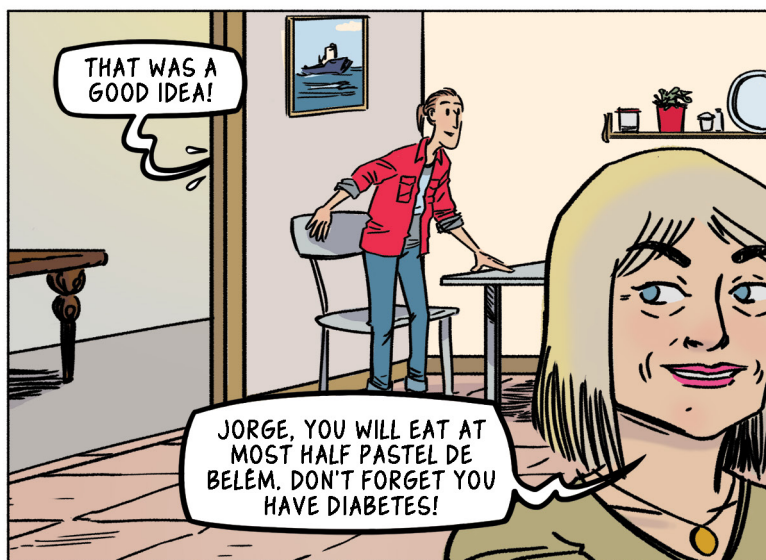
I'M GOING TO BE VERY BUSY. I'M UP TO MY NECK WITH SO MUCH WORK. SO I MIGHT LEAVE YOU HANGING.

MAYBE. I WILL TRY.

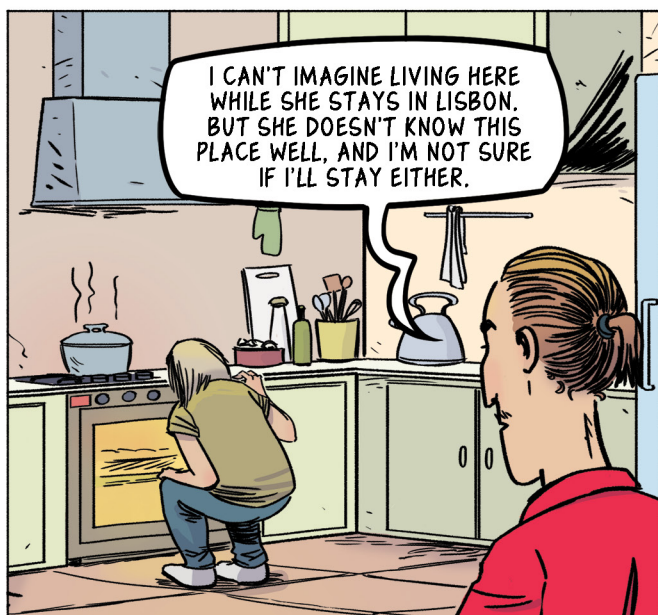
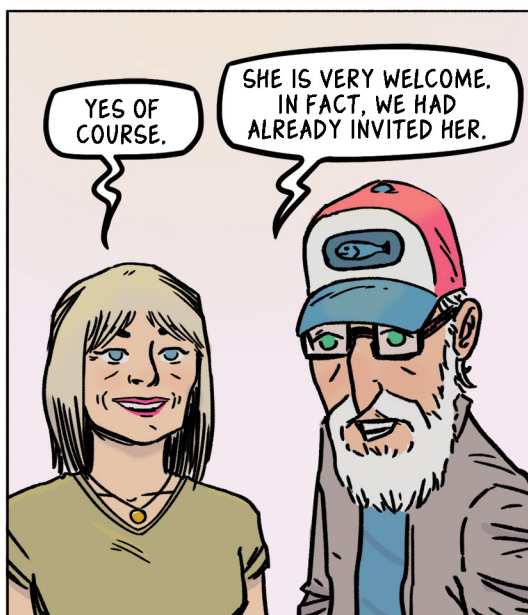
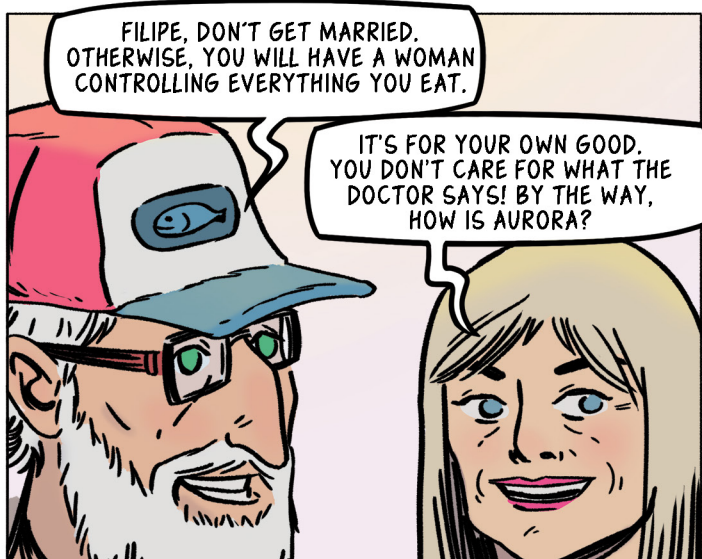


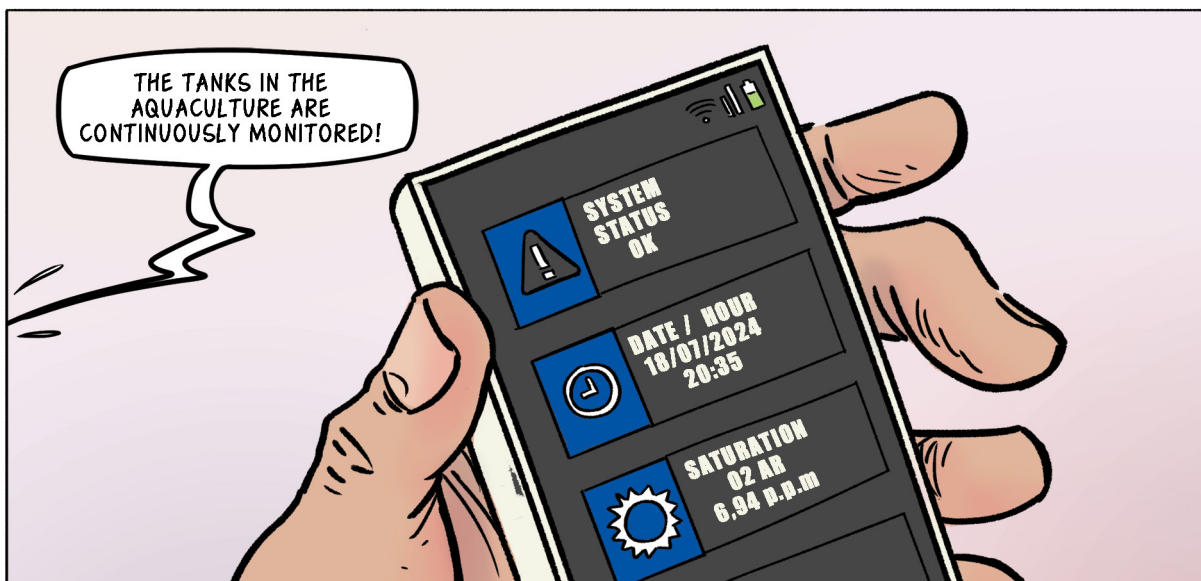
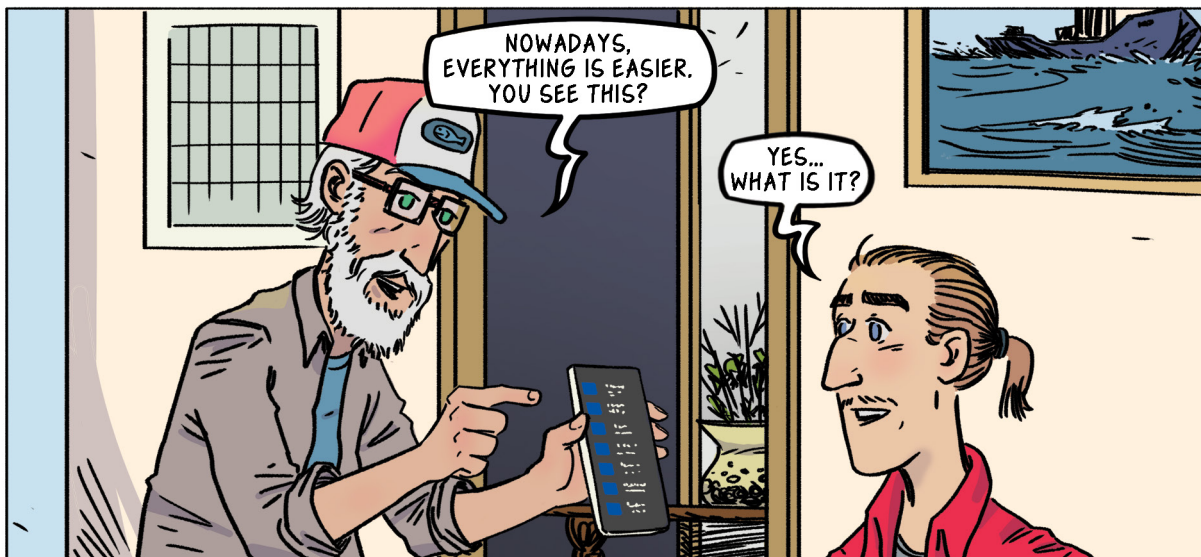
YOU CAN'T GO THERE ON A WEEKEND?



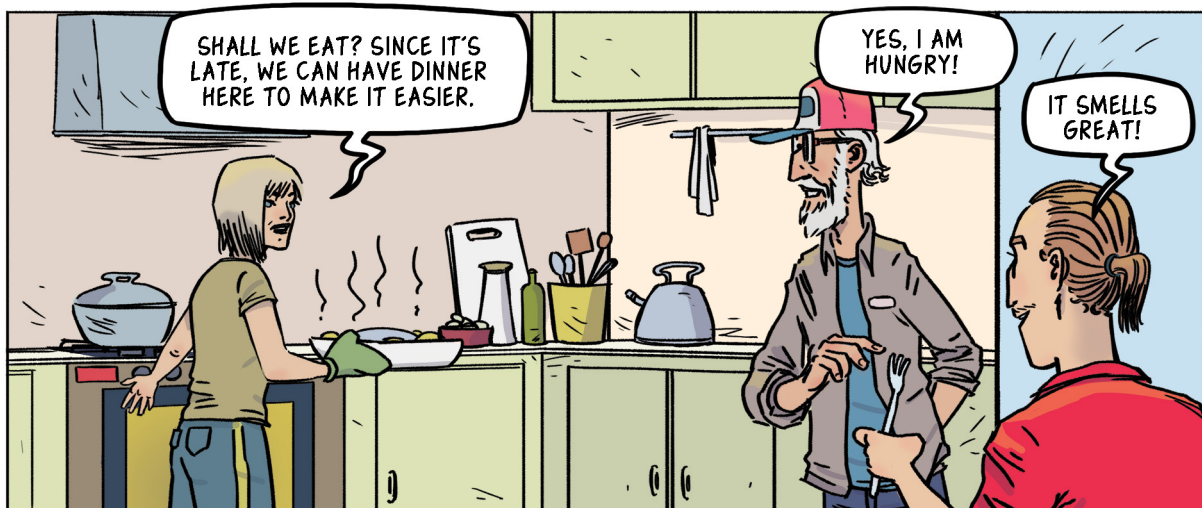


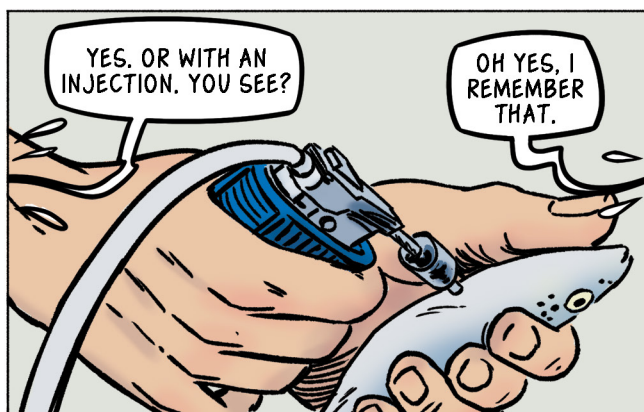
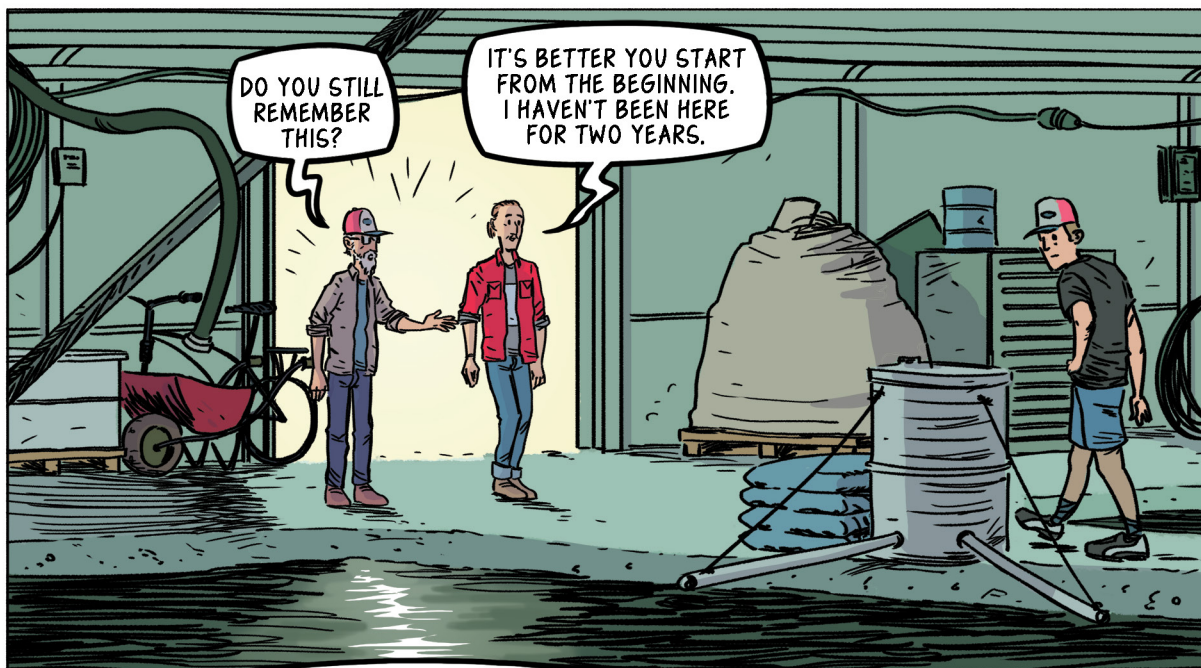




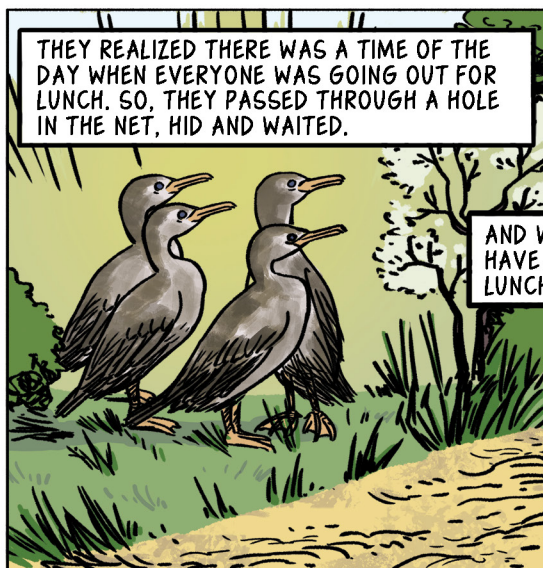
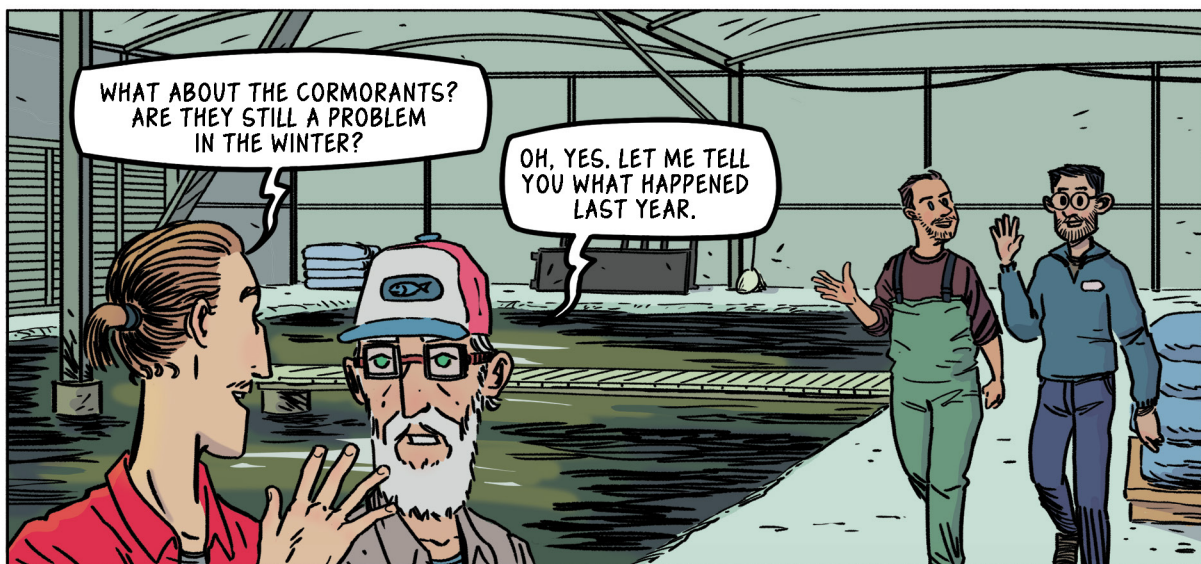




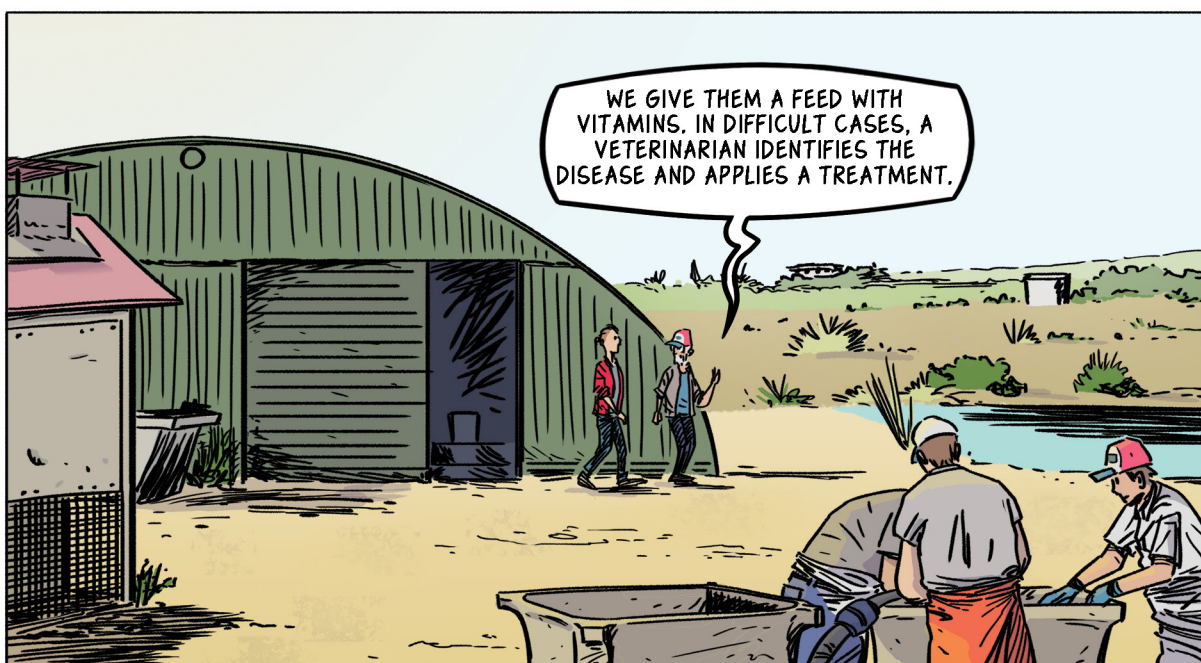
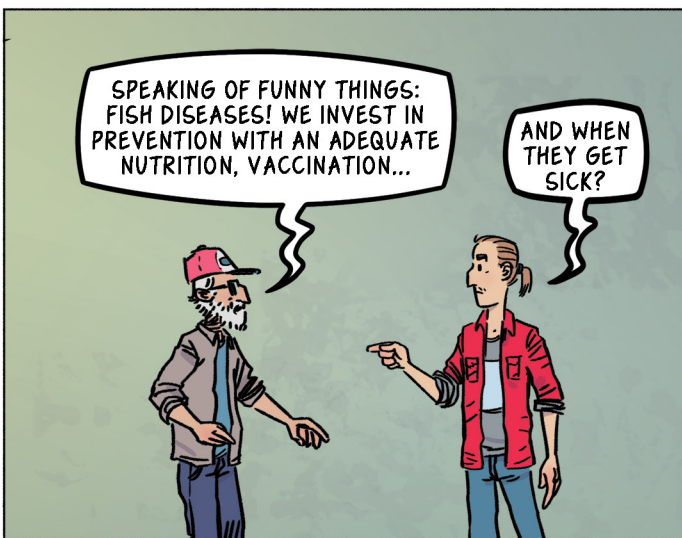






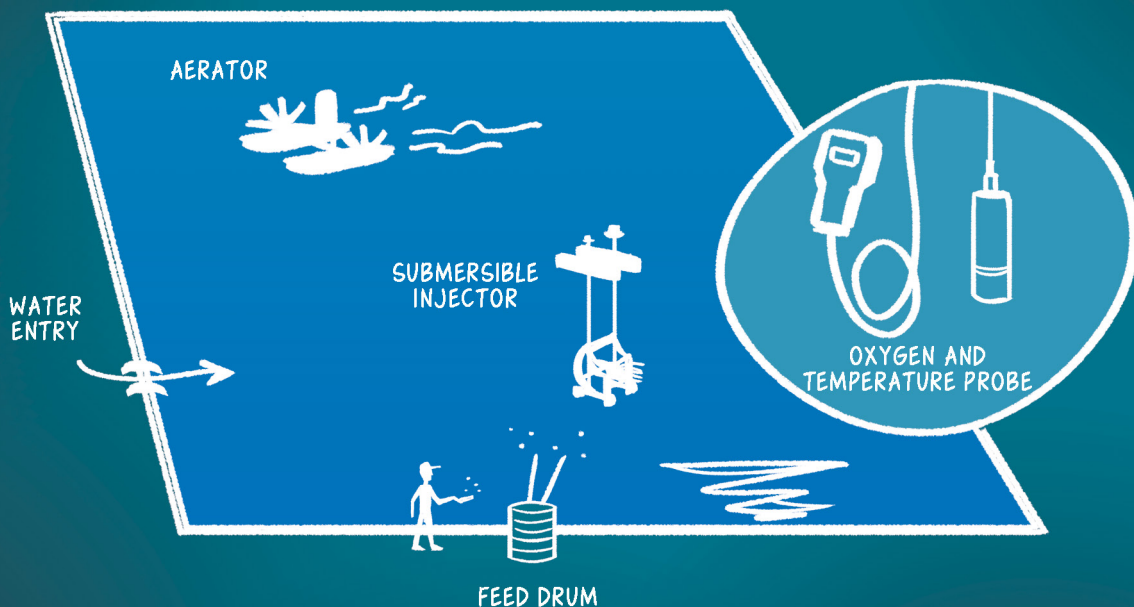




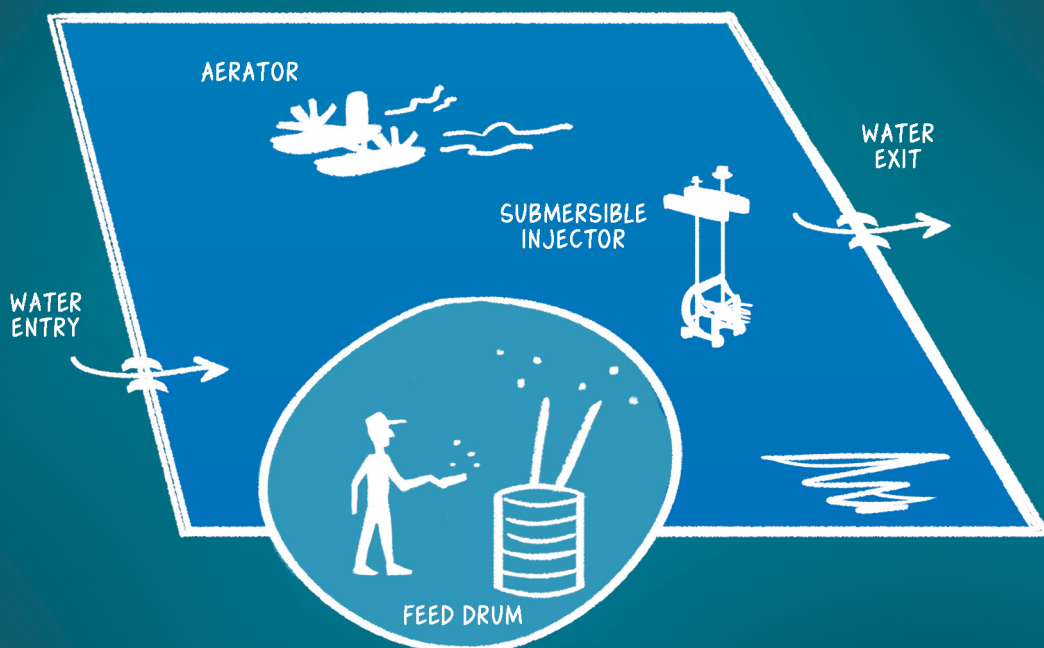


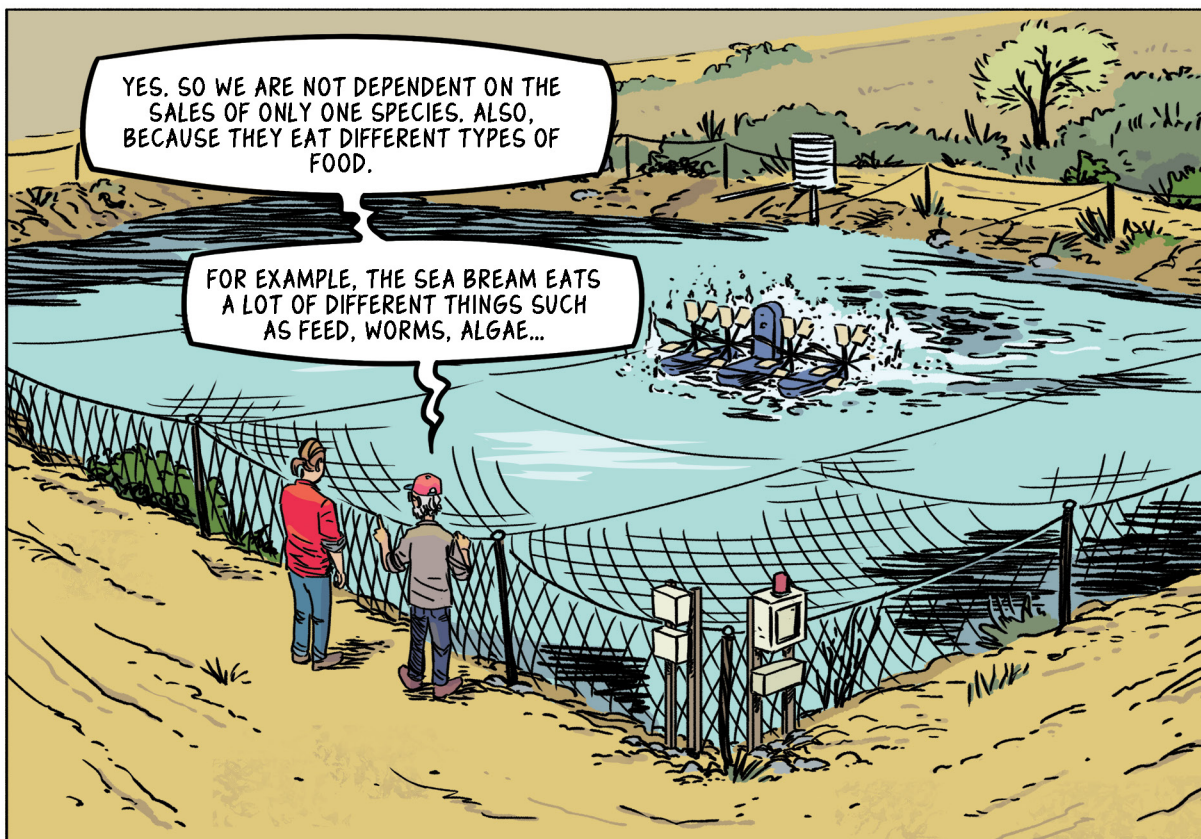
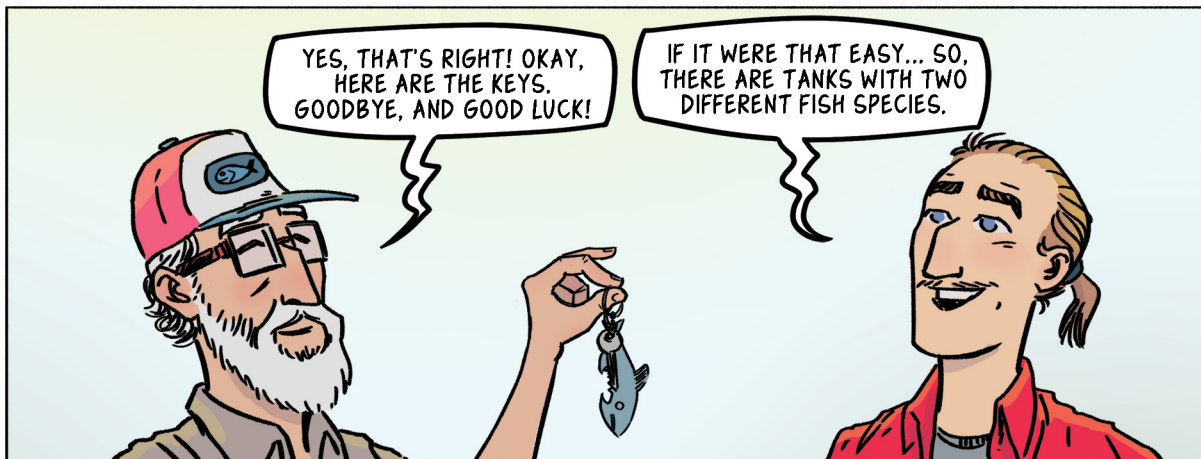


DON'T SAY ANYTHING, I'LL SEE IF I REMEMBER. WE HAVE THE OXYGEN AND TEMPERATURE PROBES. IF THERE IS A LACK OF OXYGEN IN THE WATER, THE AERATOR MIXES THE AIR AT THE SURFACE, AND THE INJECTOR INJECTS AIR IN THE BOTTOM OF THE TANK.

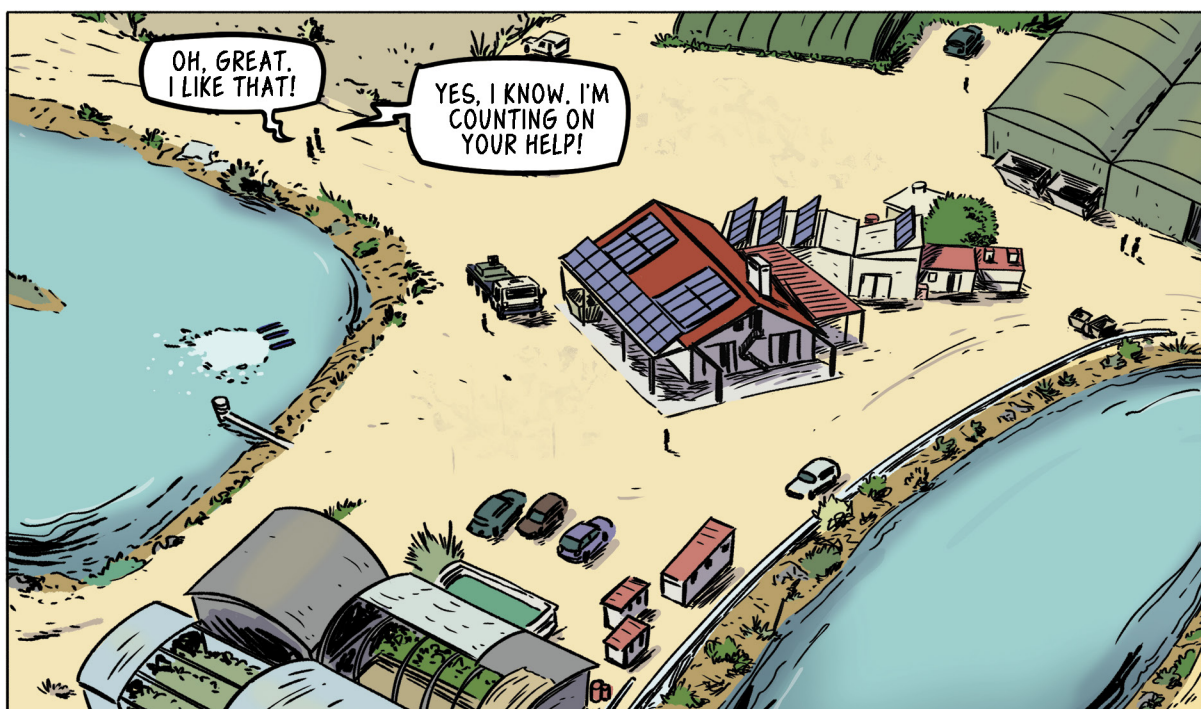
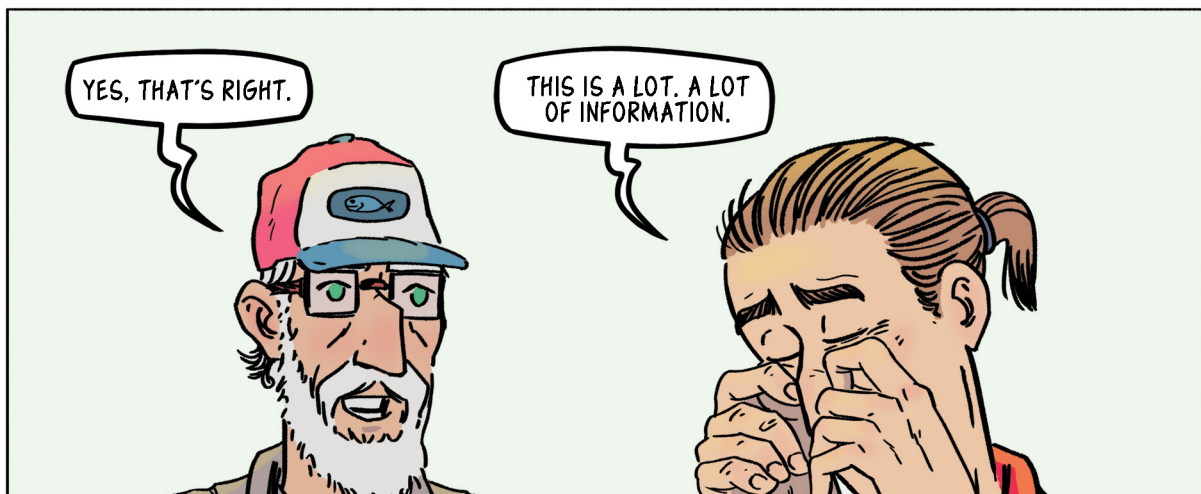


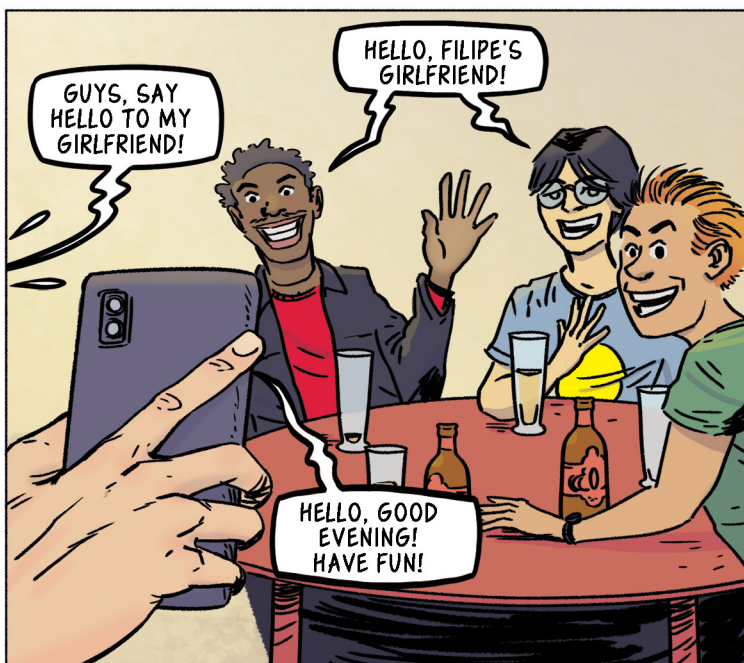
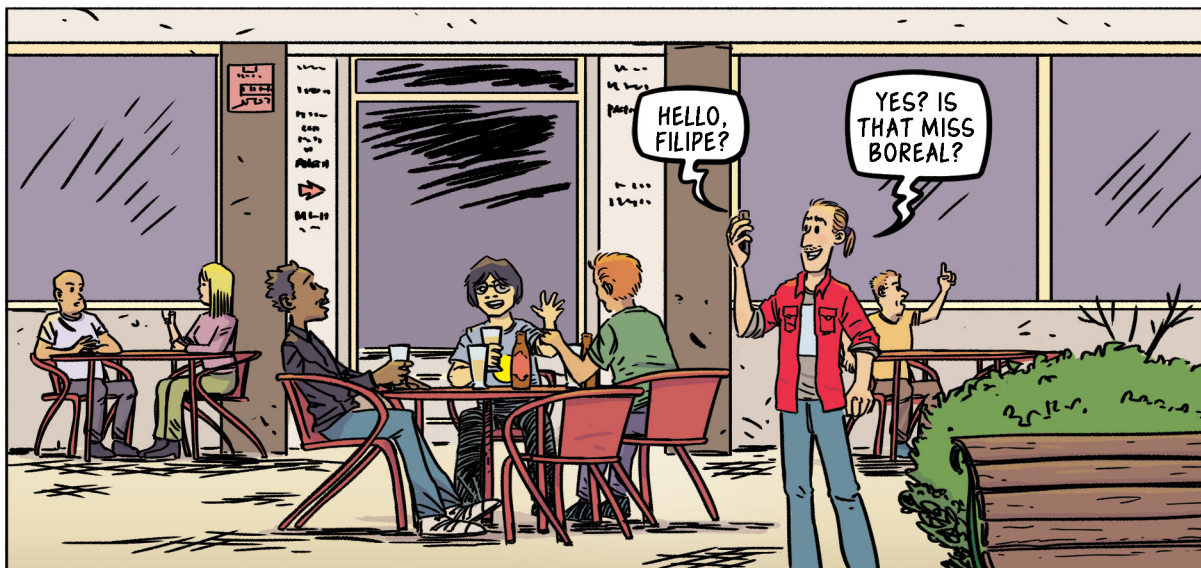
THE DRUMS DISTRIBUTE FEED, AT SPECIFIC TIMES. AND WE ALSO GIVE SOME FOOD MANUALLY, SO THAT THE FISHES THAT EAT LESS FOOD FROM THE DRUMS ARE WELL FED.



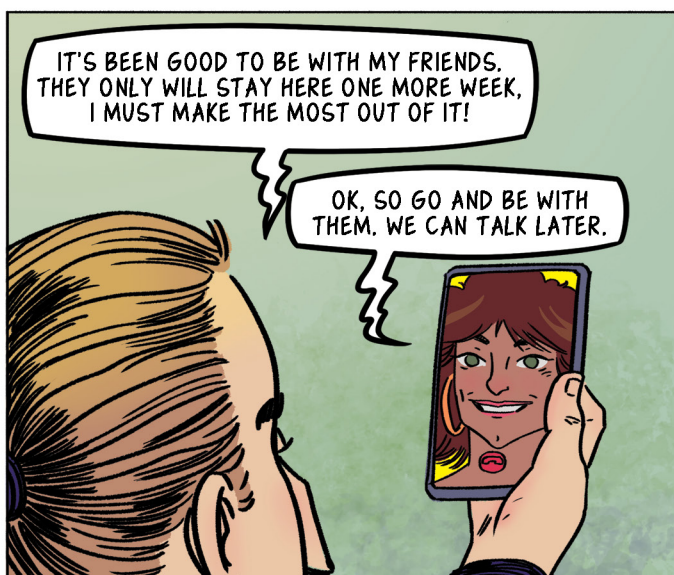
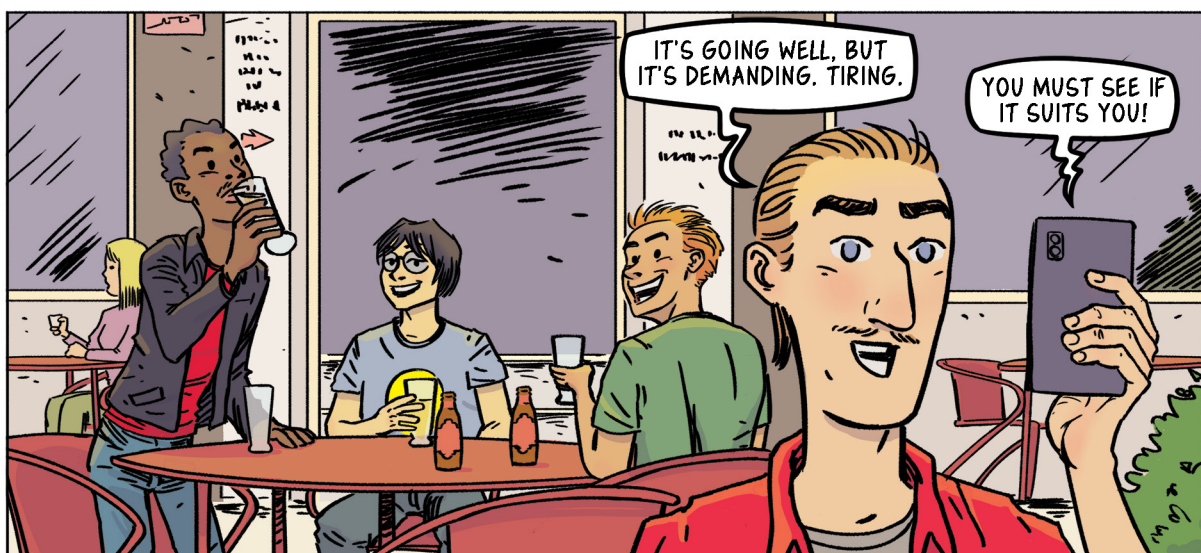




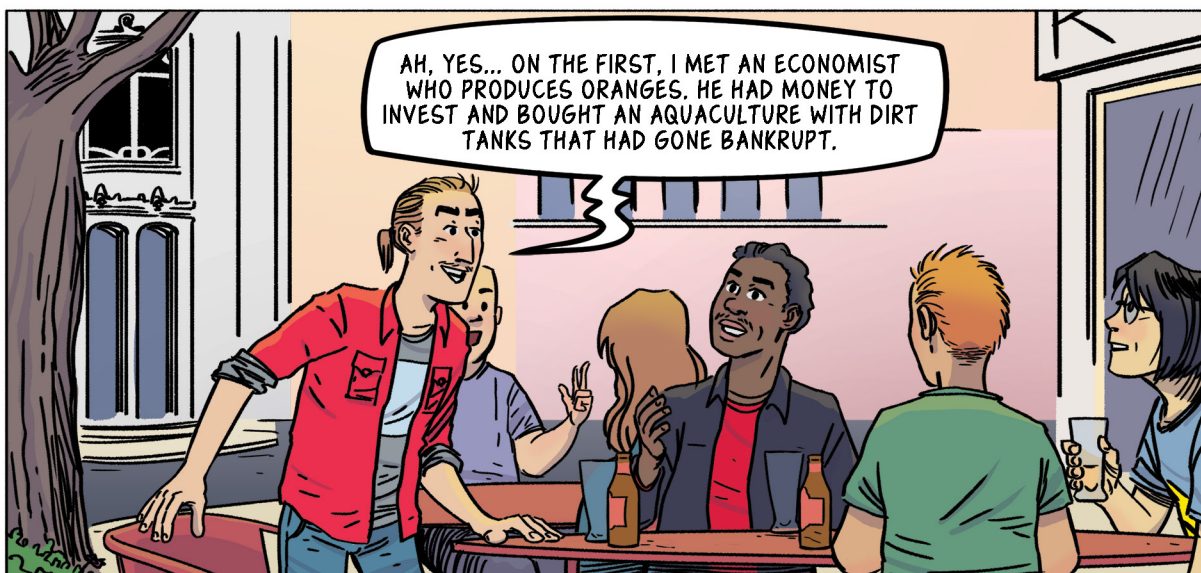




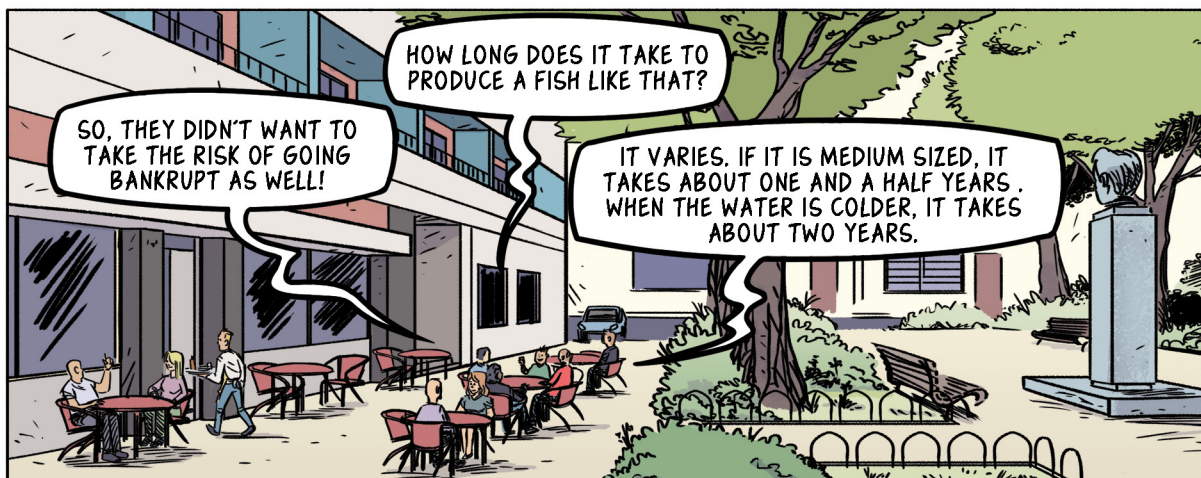
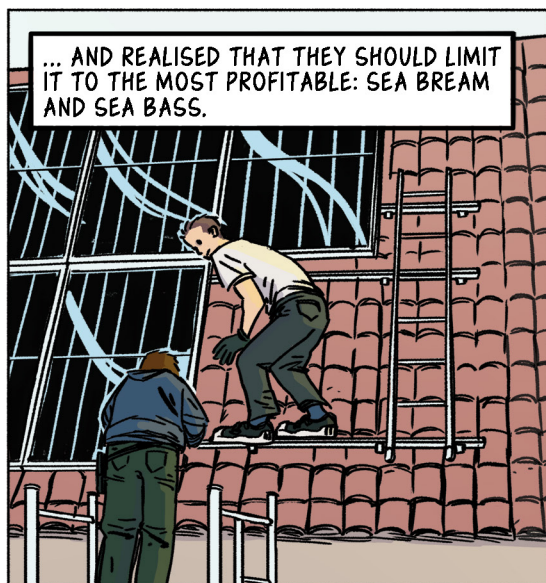
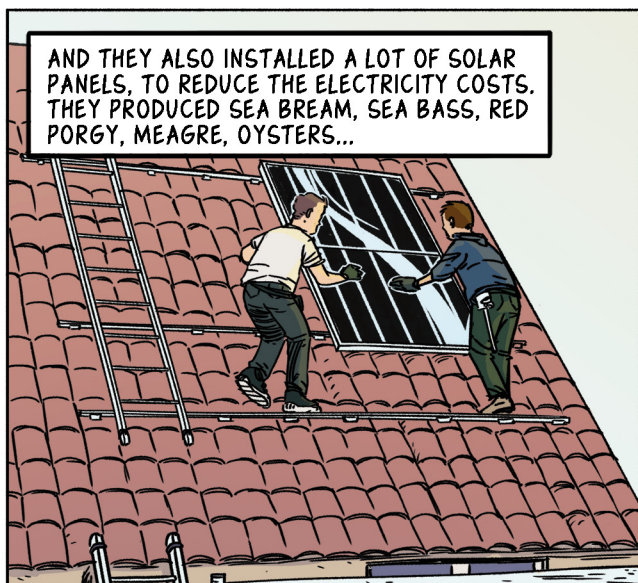
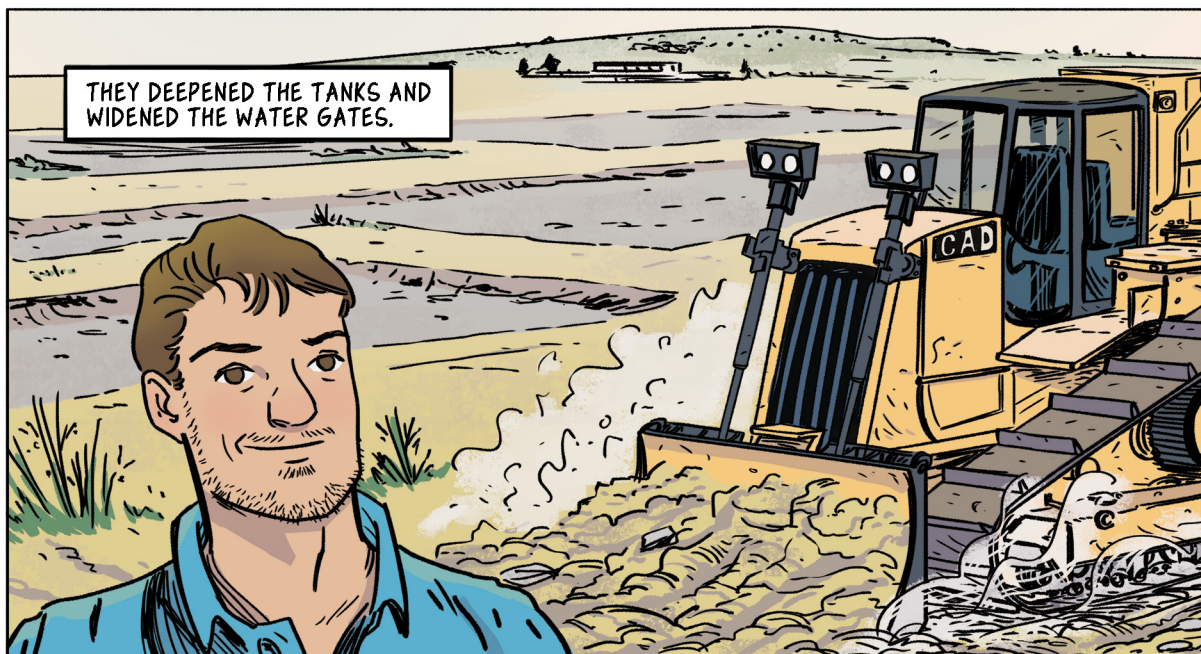




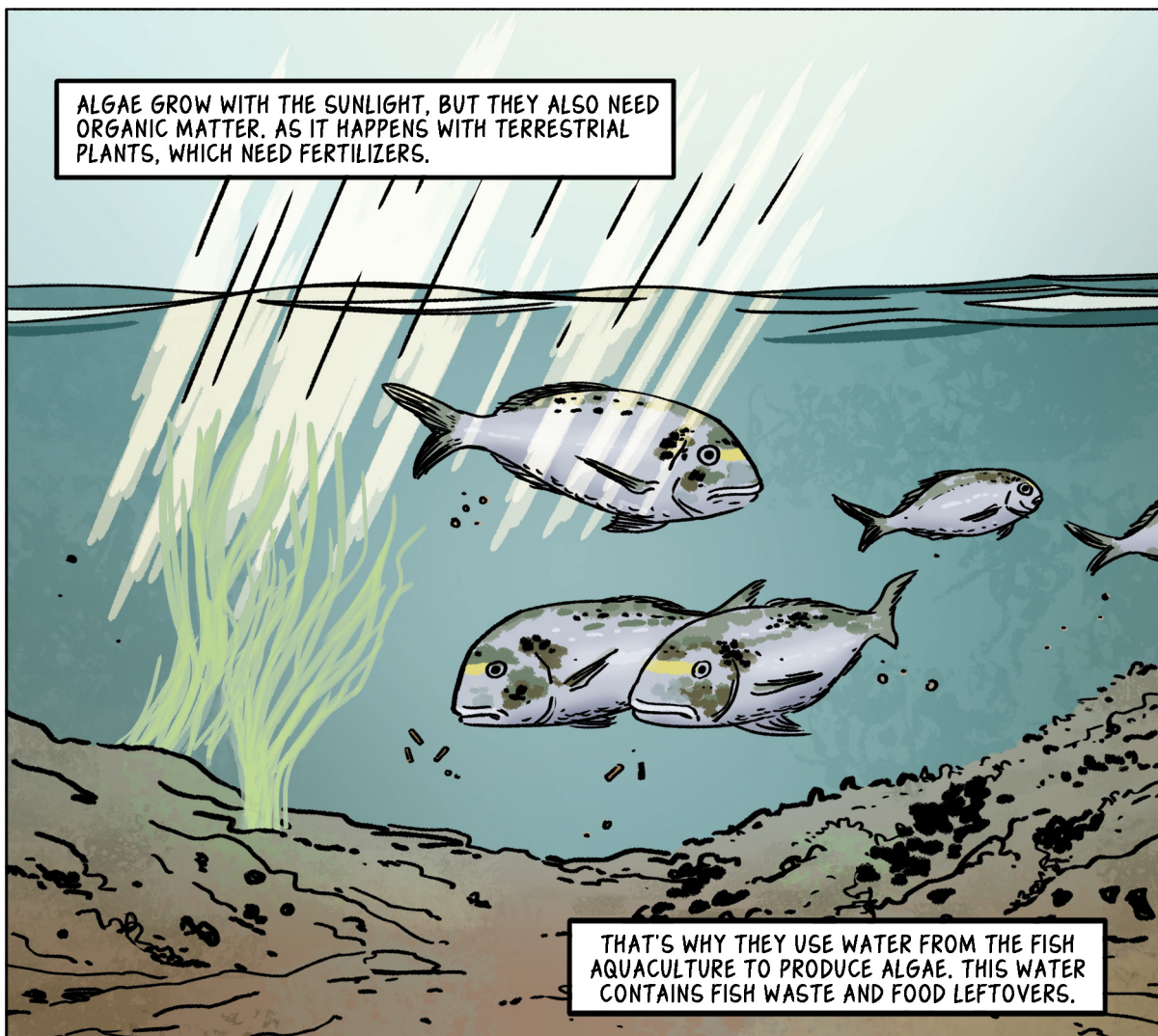
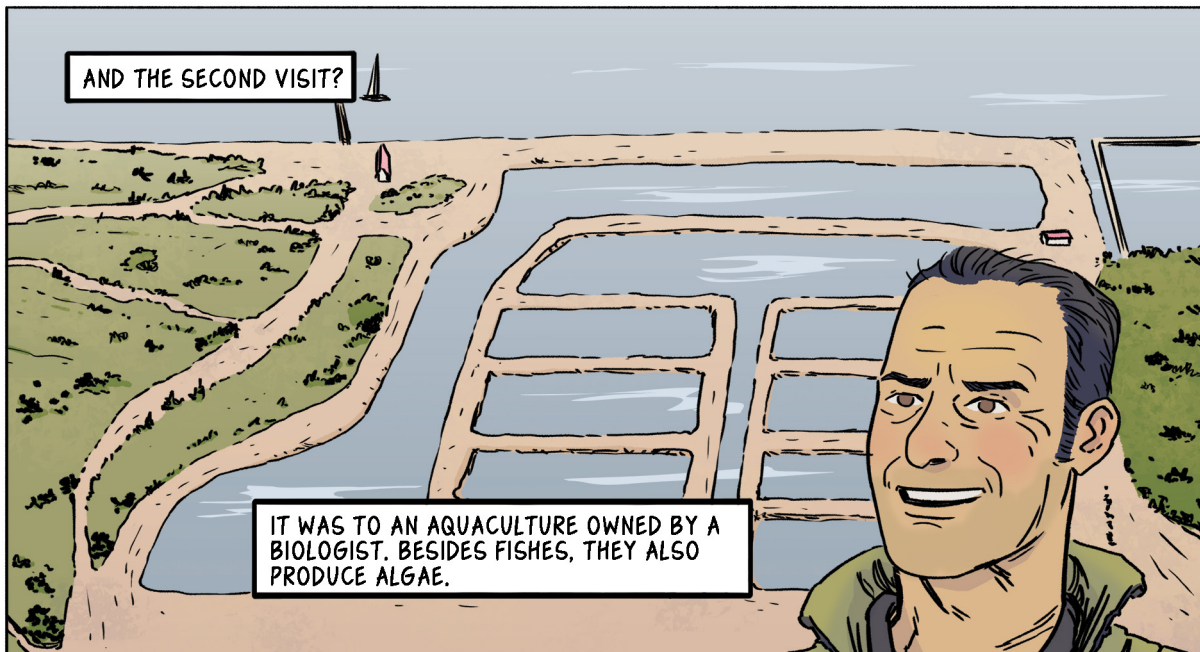




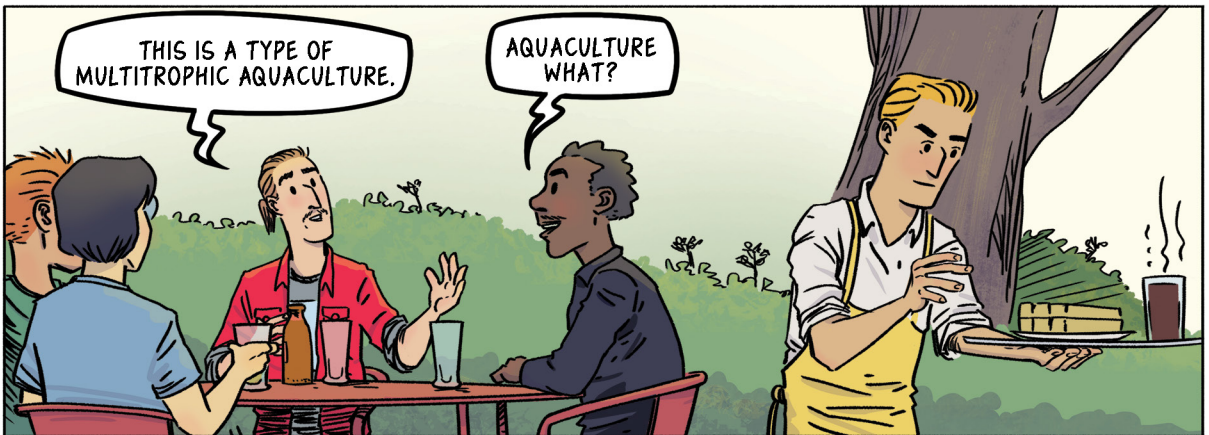






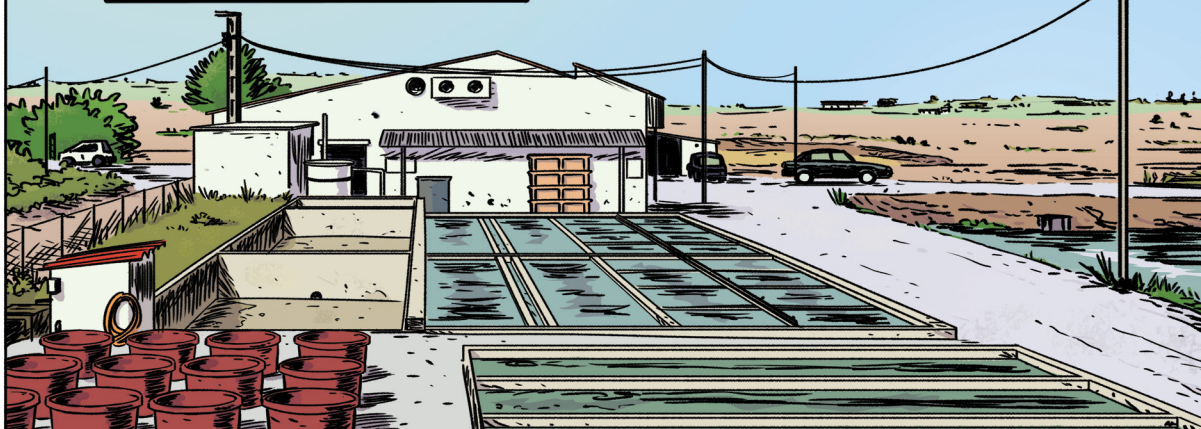




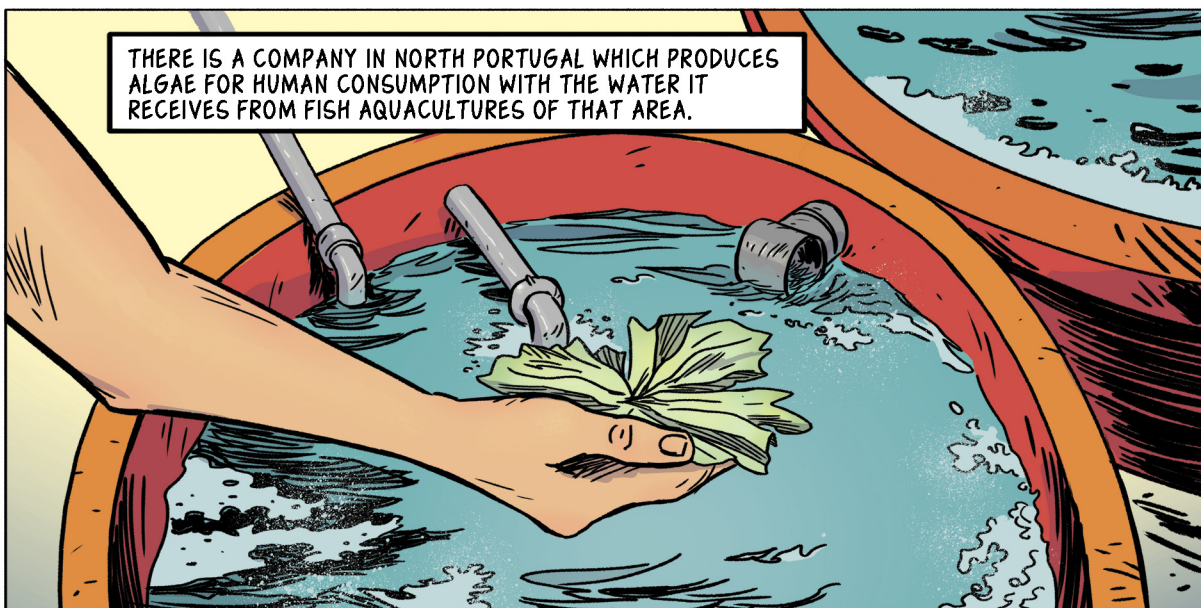




THIS IS ALSO HAPPENING AS A PARTNERSHIP BETWEEN COMPANIES.



THERE IS A COMPANY IN NORTH PORTUGAL WHICH PRODUCES ALGAE FOR HUMAN CONSUMPTION WITH THE WATER IT RECEIVES FROM FISH AQUACULTURES OF THAT AREA.



SO, THERE ARE TWO PRODUCTIONS INSTEAD OF ONE. AND WE REDUCE THE ENVIRONMENTAL IMPACT OF THE AQUACULTURE BECAUSE THE WATER GETS CLEANER.



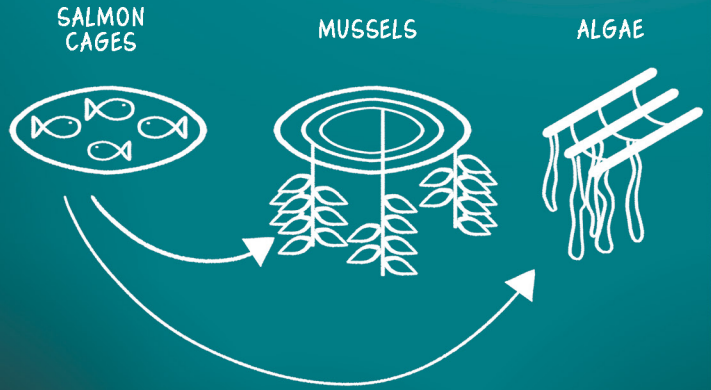




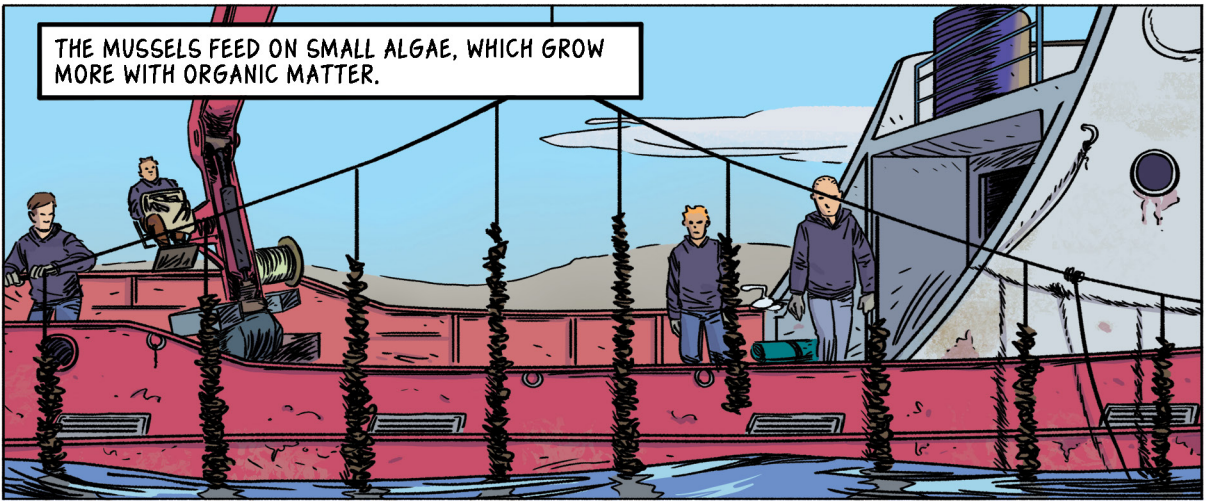
AND THE MOST USUAL COMBINATION IS FISH AND SEAWEED?

YES. BUT THERE ARE OTHERS.

FOR EXAMPLE, IN A BAY IN CANADA, THEY ARE EXPERIMENTS TO PRODUCE SALMON, ALGAE AND MUSSELS.

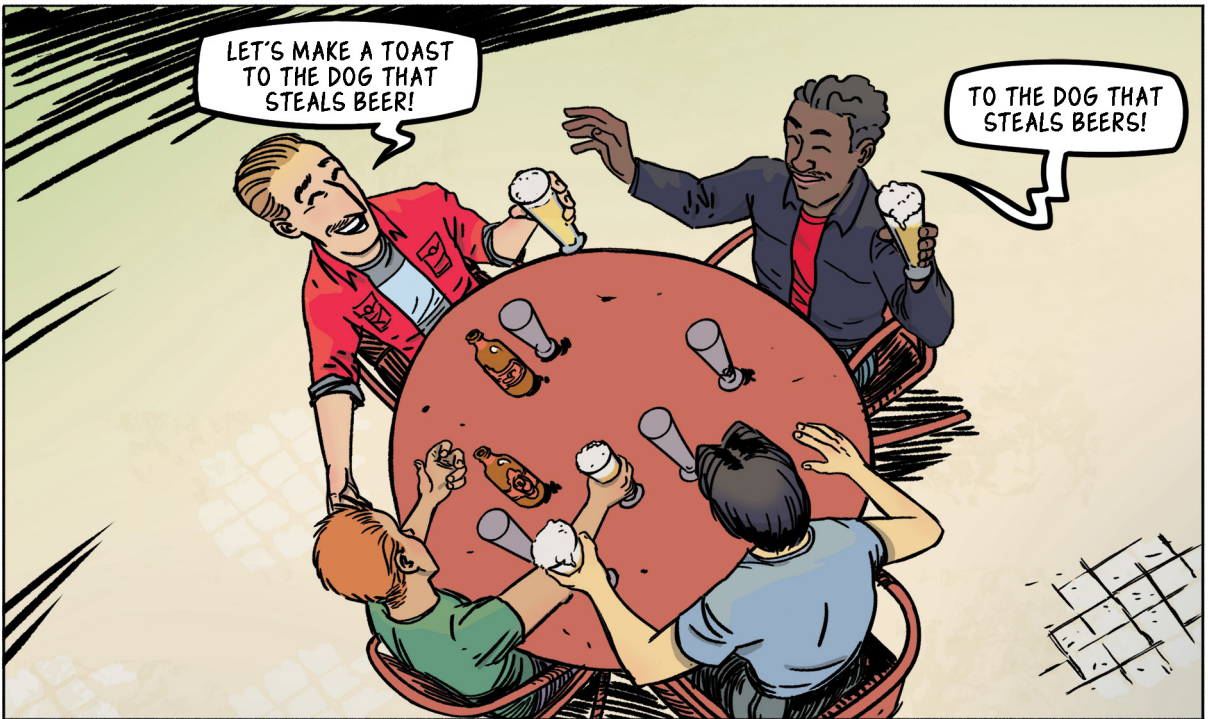
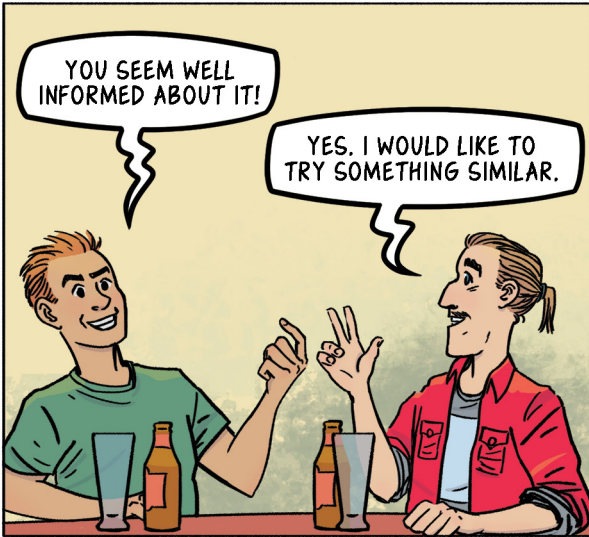


THE MUSSELS FEED ON SMALL ALGAE, WHICH GROW MORE WITH ORGANIC MATTER.

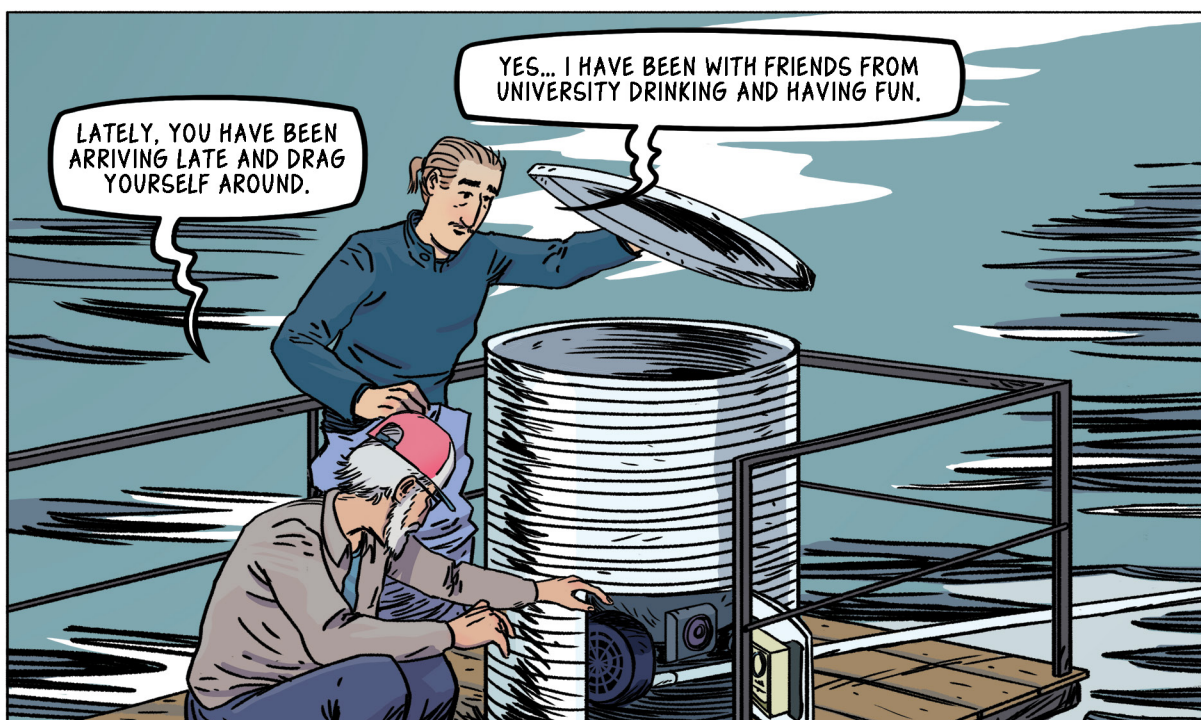
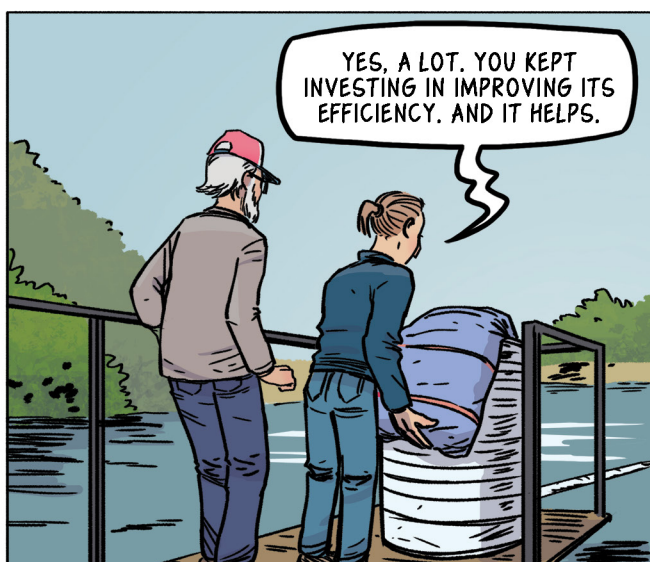
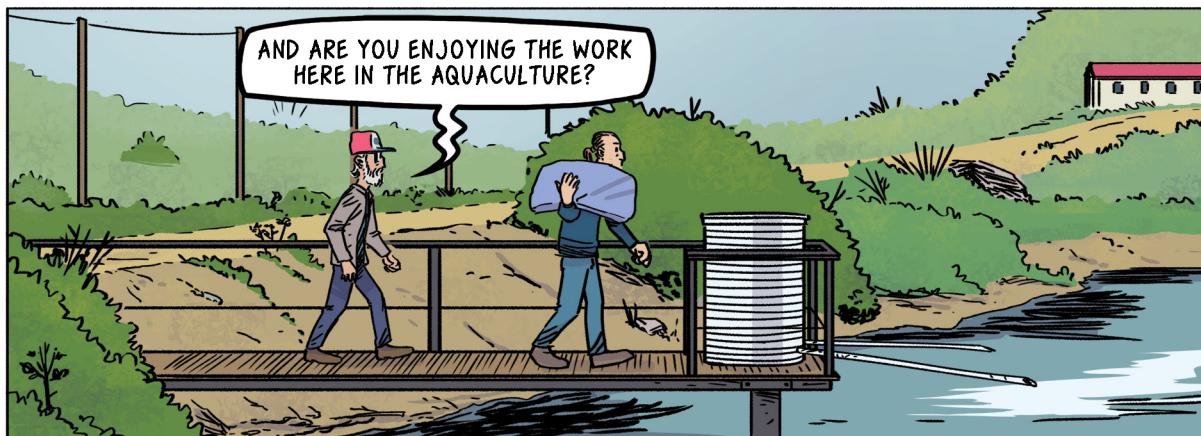


SIMILAR EXPERIMENTS ARE ALSO BEING CARRIED OUT IN OTHER AREAS OF THE WORLD SUCH AS NORTHERN EUROPE OR ASIA.

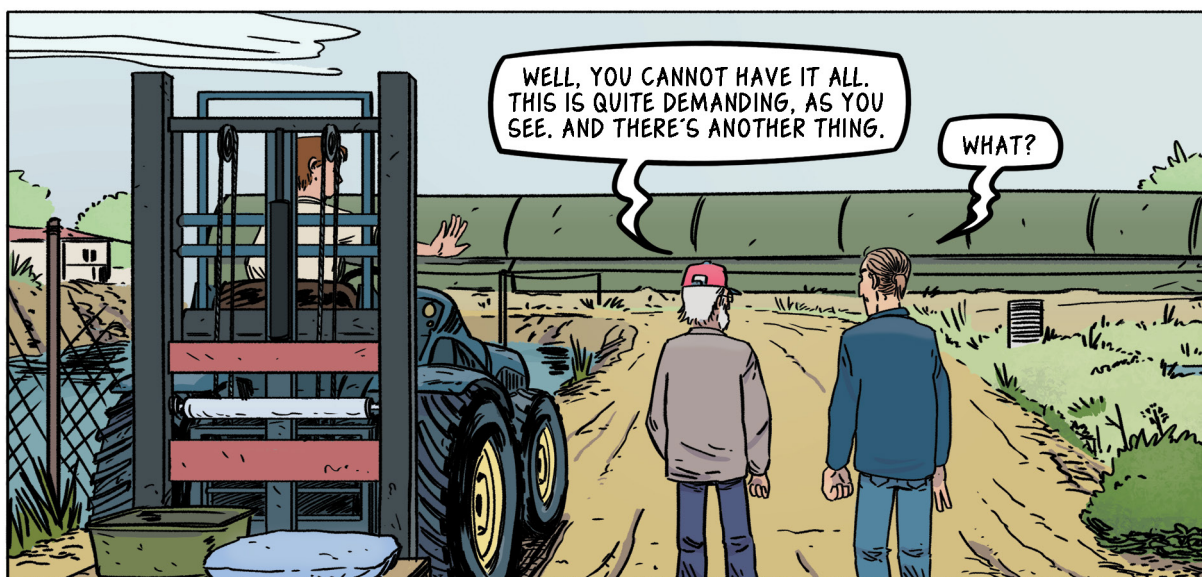
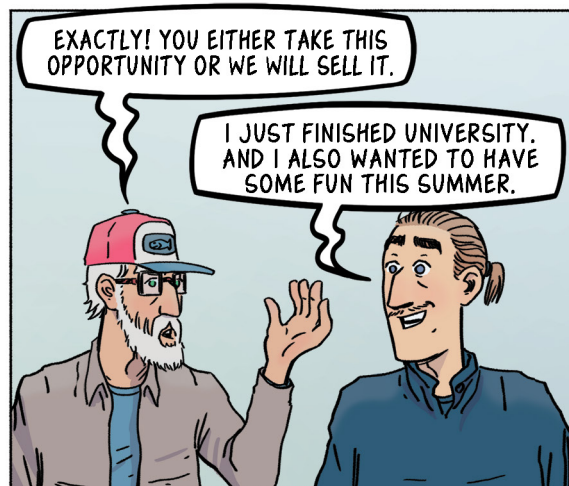
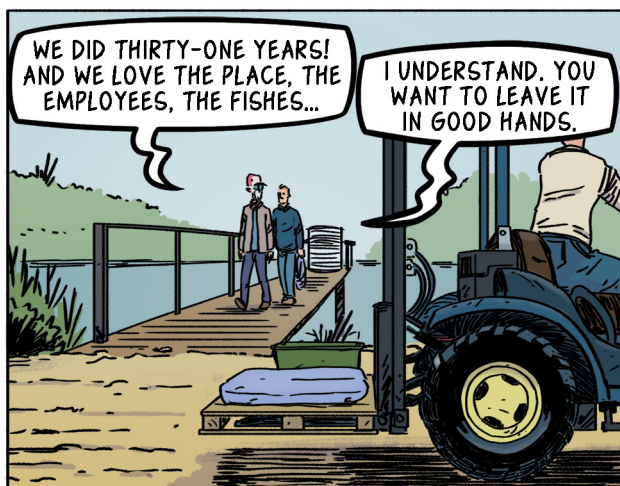
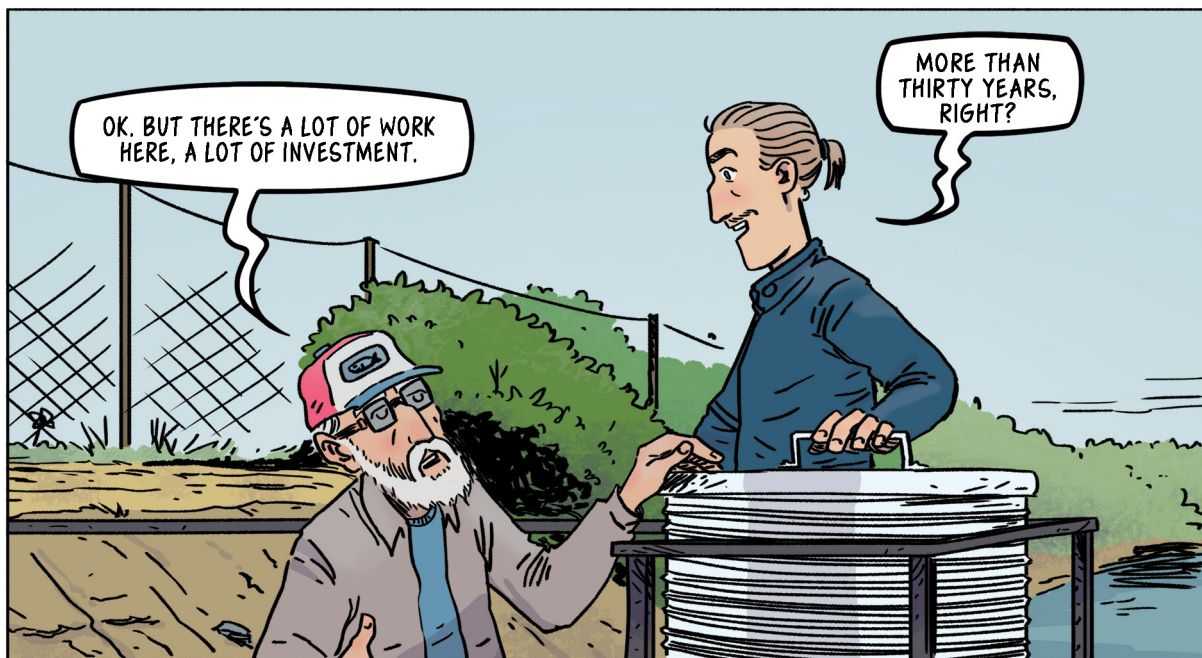




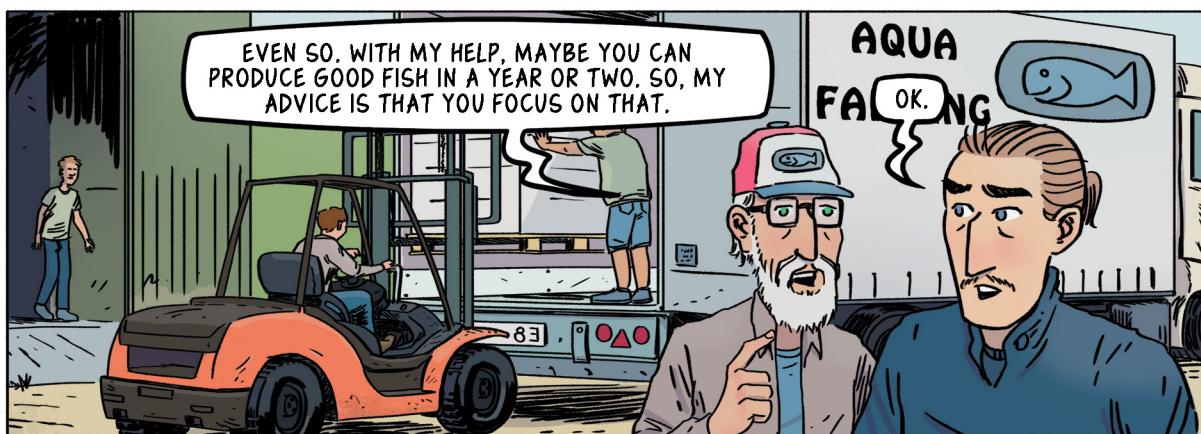
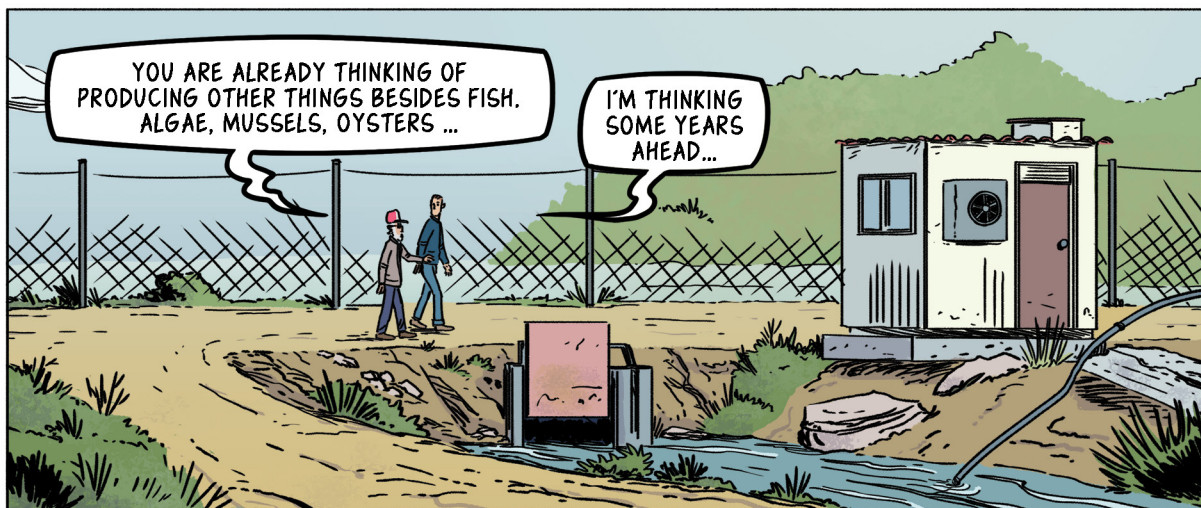




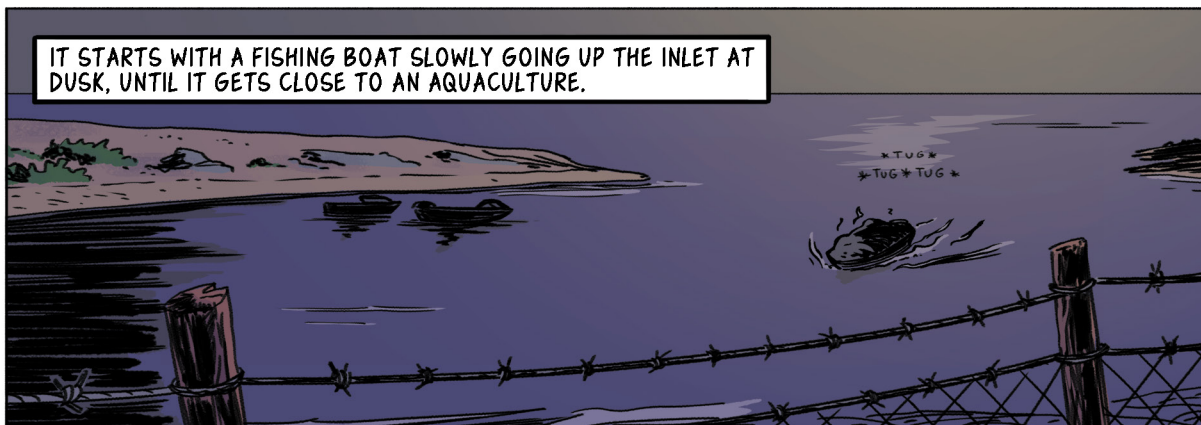
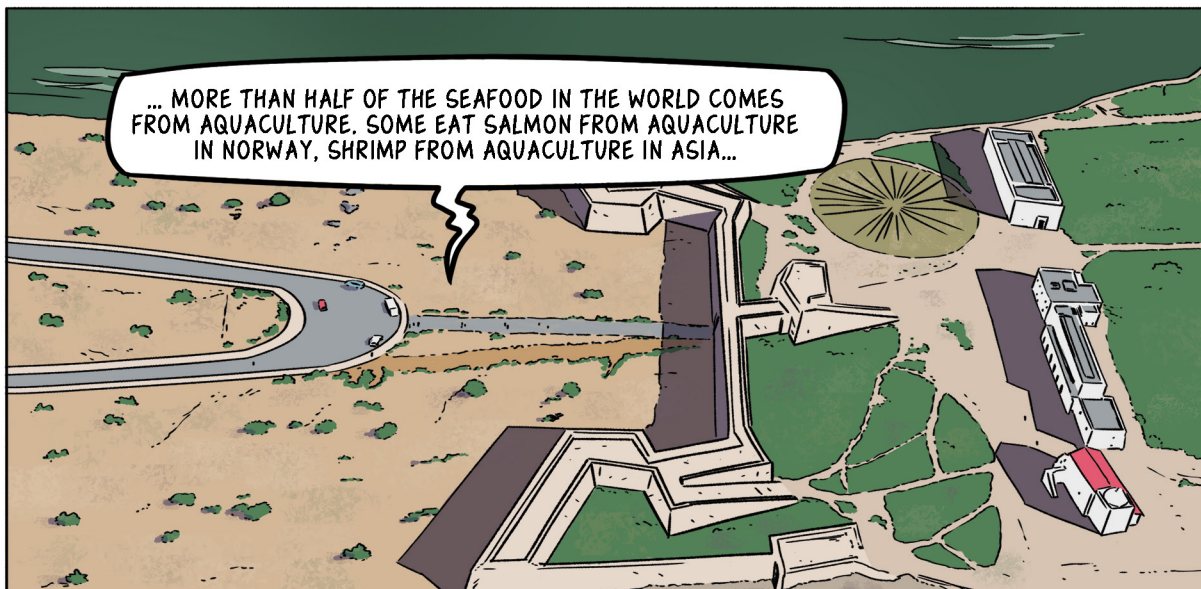








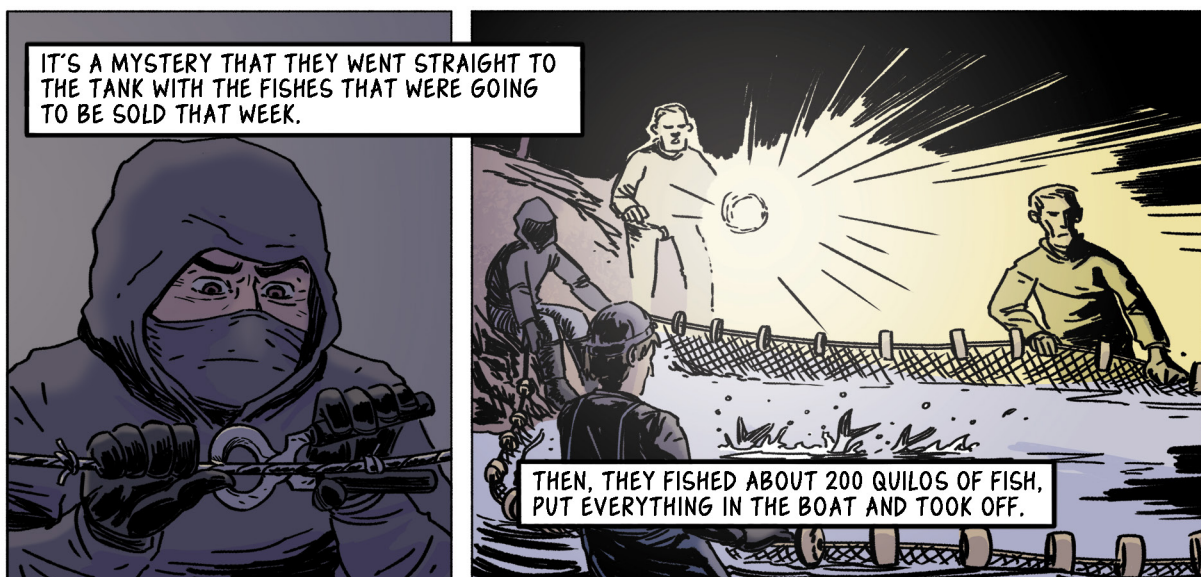








THEY CUT THE NET AND ENTERED.



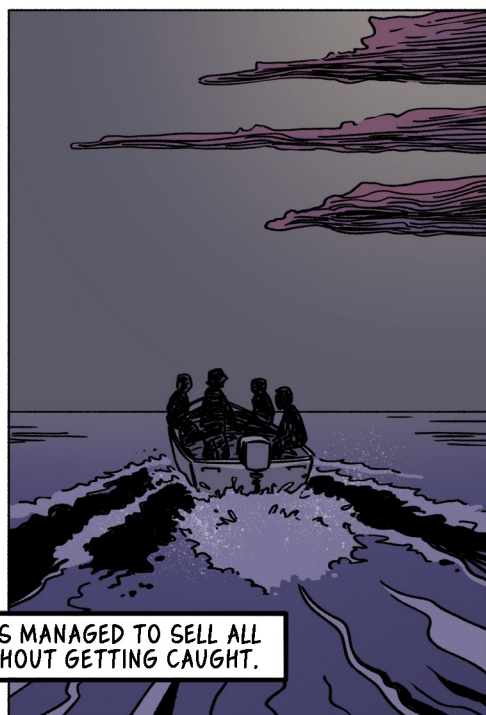
IT'S A MYSTERY THAT THEY WENT STRAIGHT TO THE TANK WITH THE FISHES THAT WERE GOING TO BE SOLD THAT WEEK.

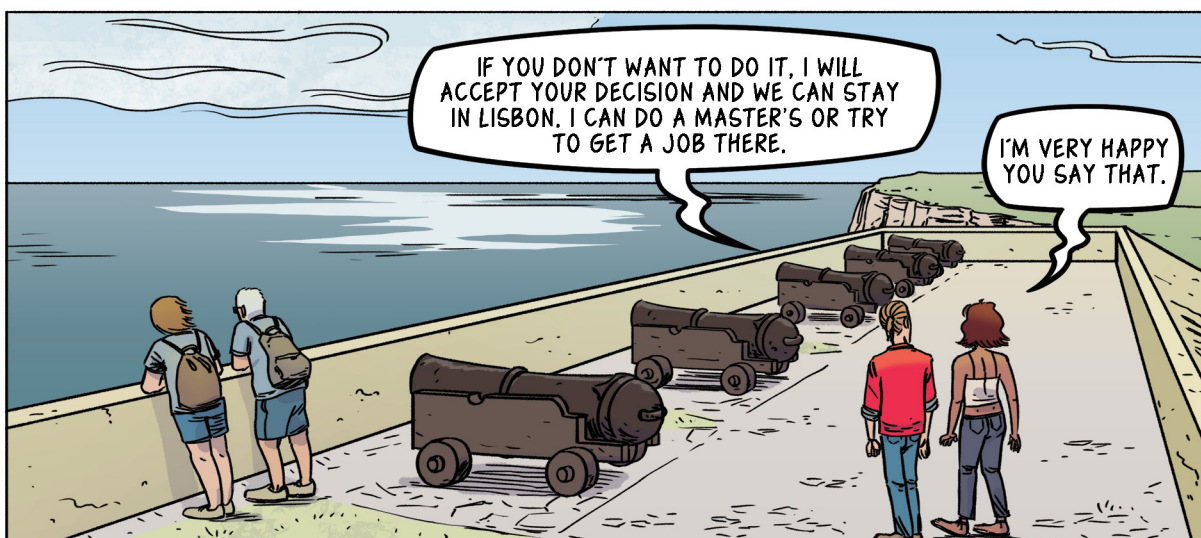
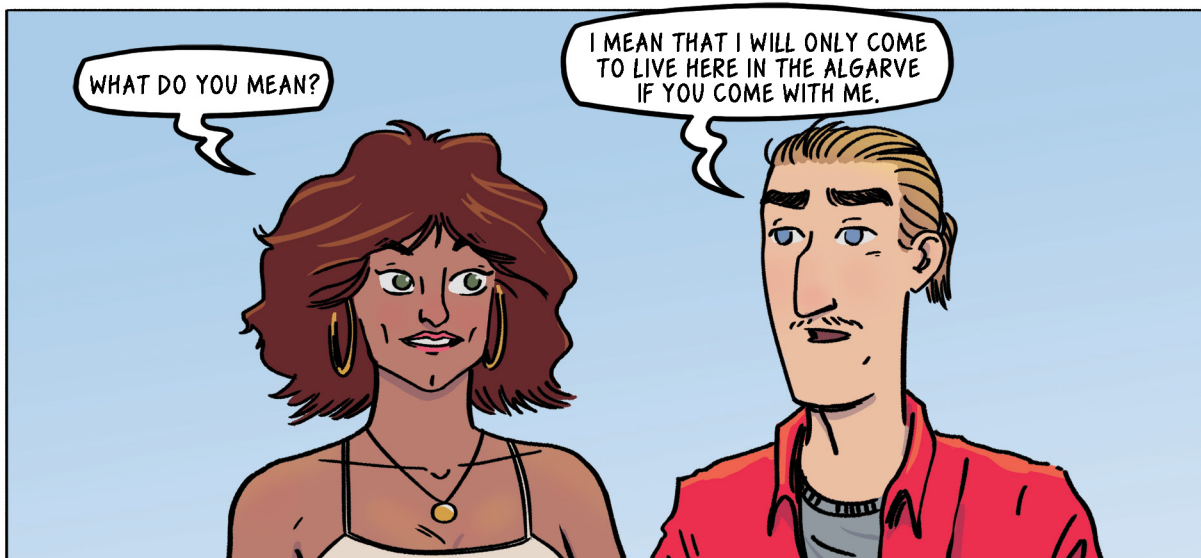
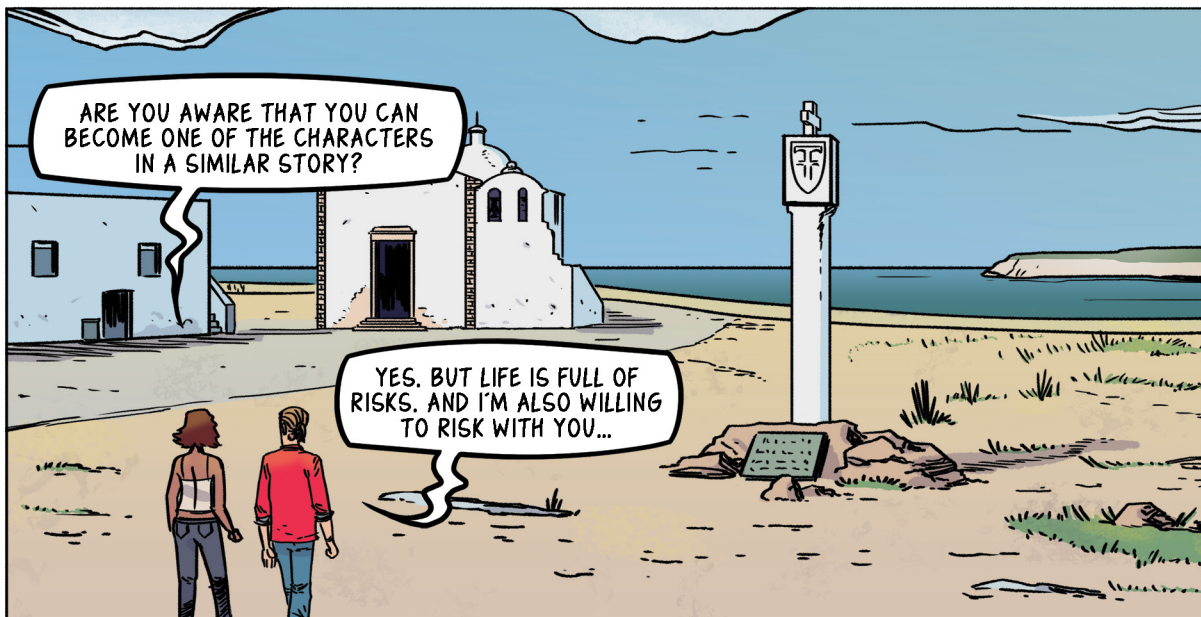
THEN, THEY FISHED ABOUT 200 QUILOS OF FISH, PUT EVERYTHING IN THE BOAT AND TOOK OFF.



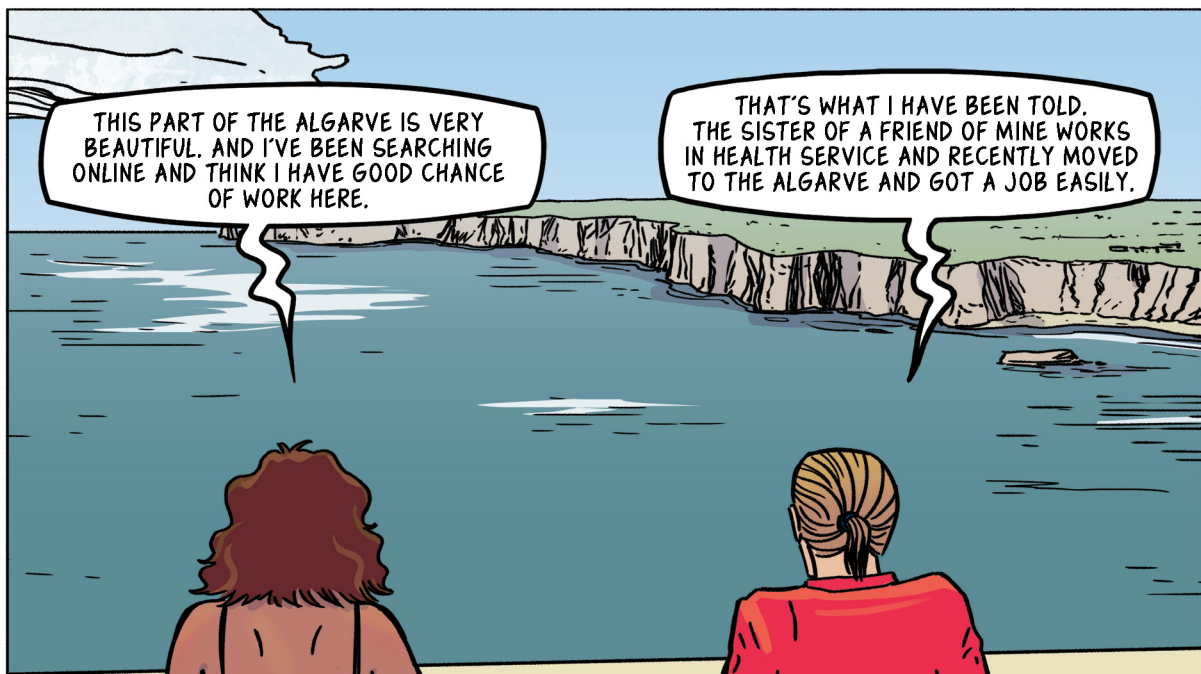
IT'S NOT CLEAR IF THE NIGHT GUARD DIDN'T SEE OR PRETENDED HE DIDN'T SEE.

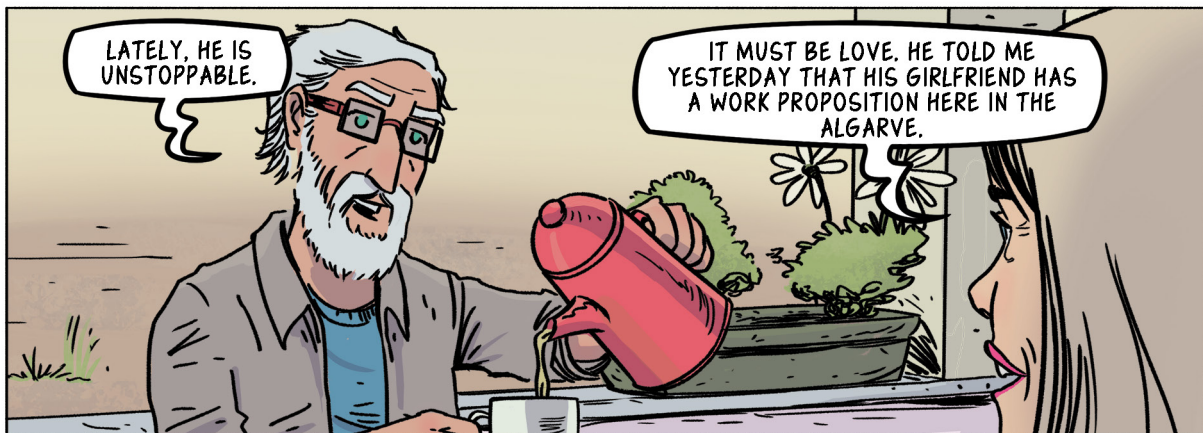
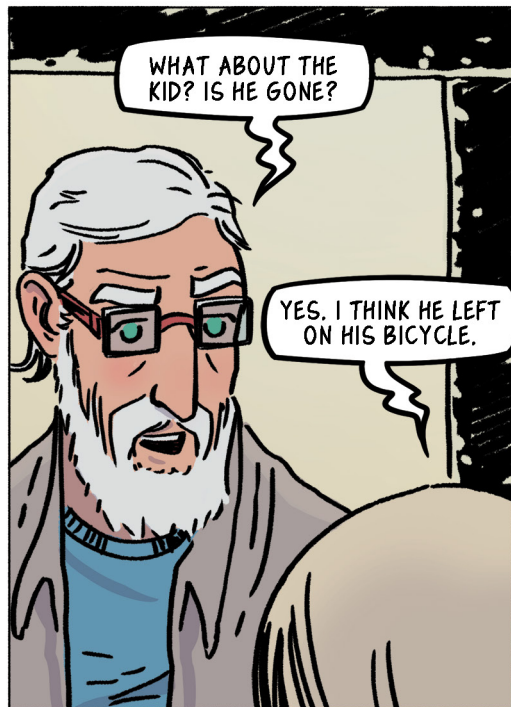
ANYWAY, THOSE GUYS MANAGED TO SELL ALL THE STOLEN FISH WITHOUT GETTING CAUGHT.













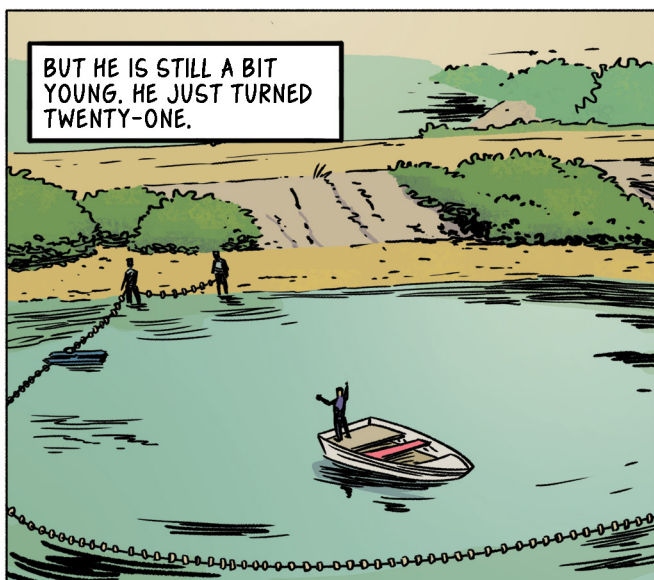
HE ARRIVES EARLY, FULL OF ENERGY, AND WORKS REALLY HARD.



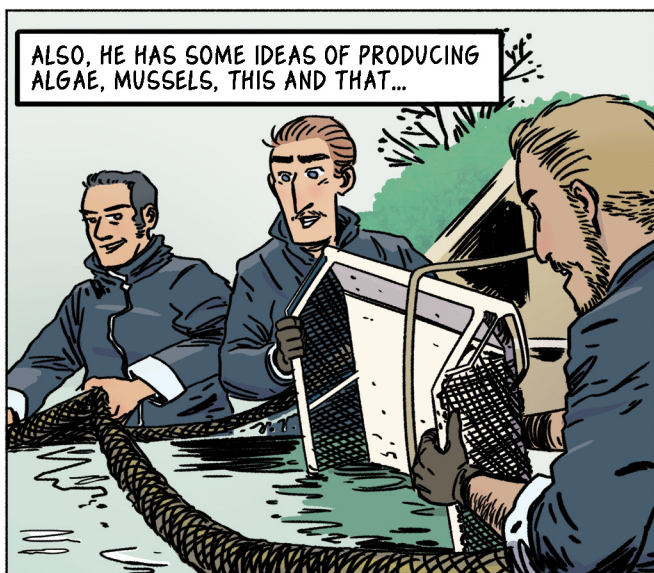
HE LIKES WHAT HE DOES AND HAS INTEREST IN THE SUBJECT.



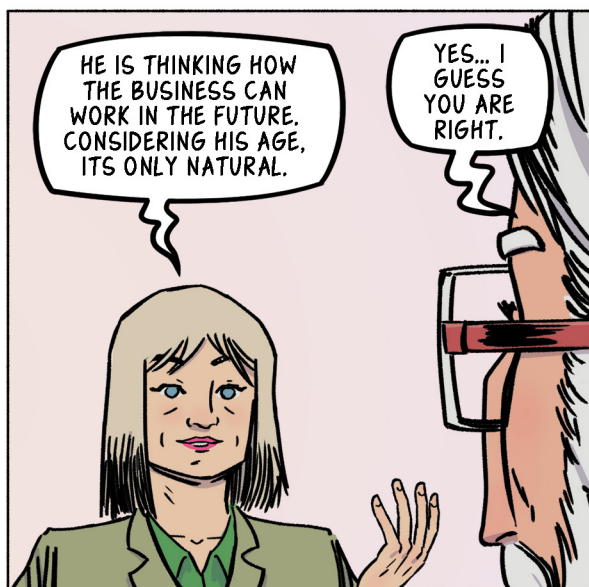
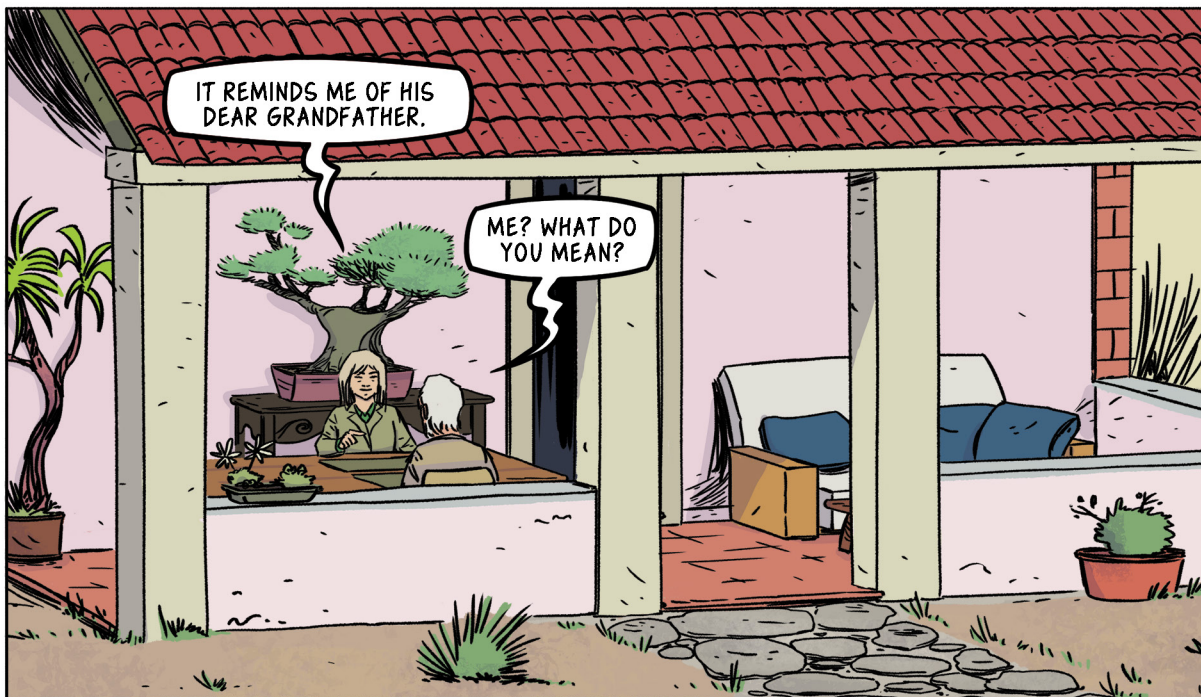
BUT HE IS STILL A BIT YOUNG. HE JUST TURNED TWENTY-ONE.



ALSO, HE HAS SOME IDEAS OF PRODUCING ALGAE, MUSSELS, THIS AND THAT...

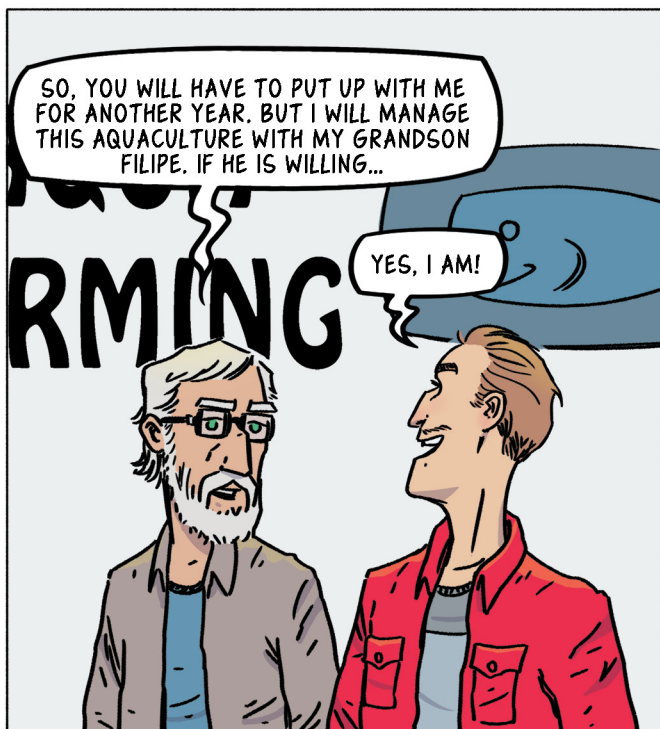




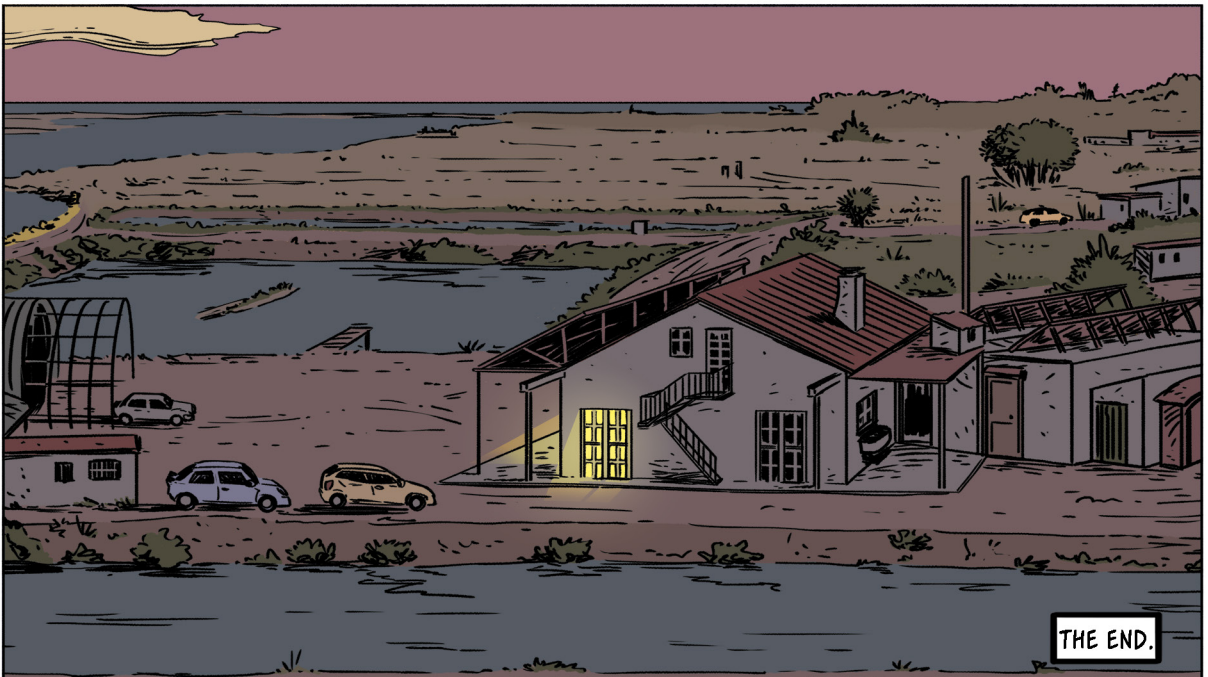
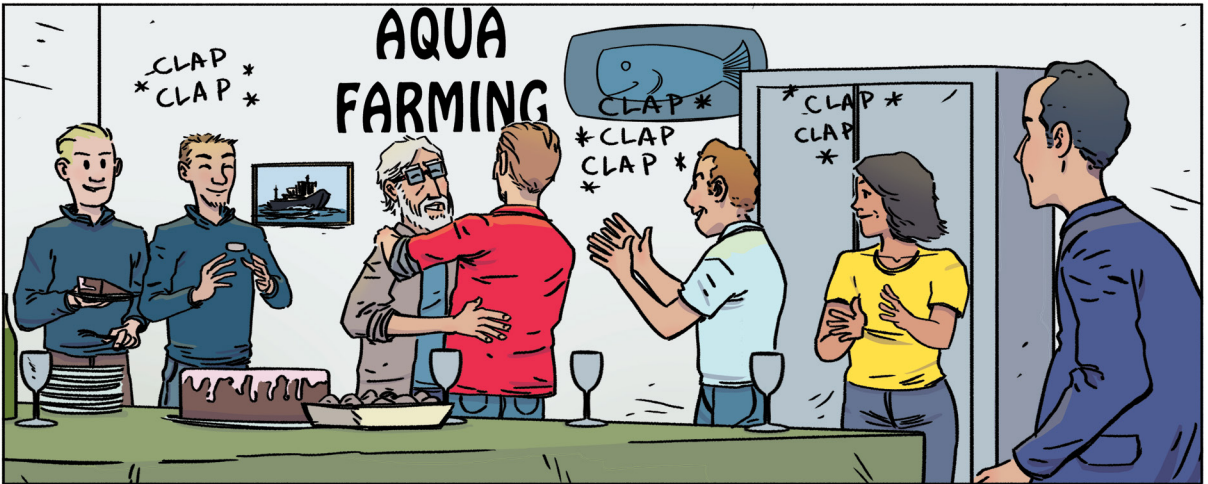
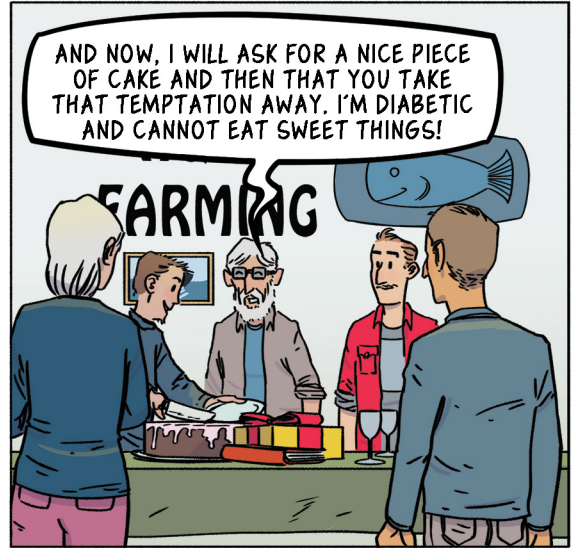










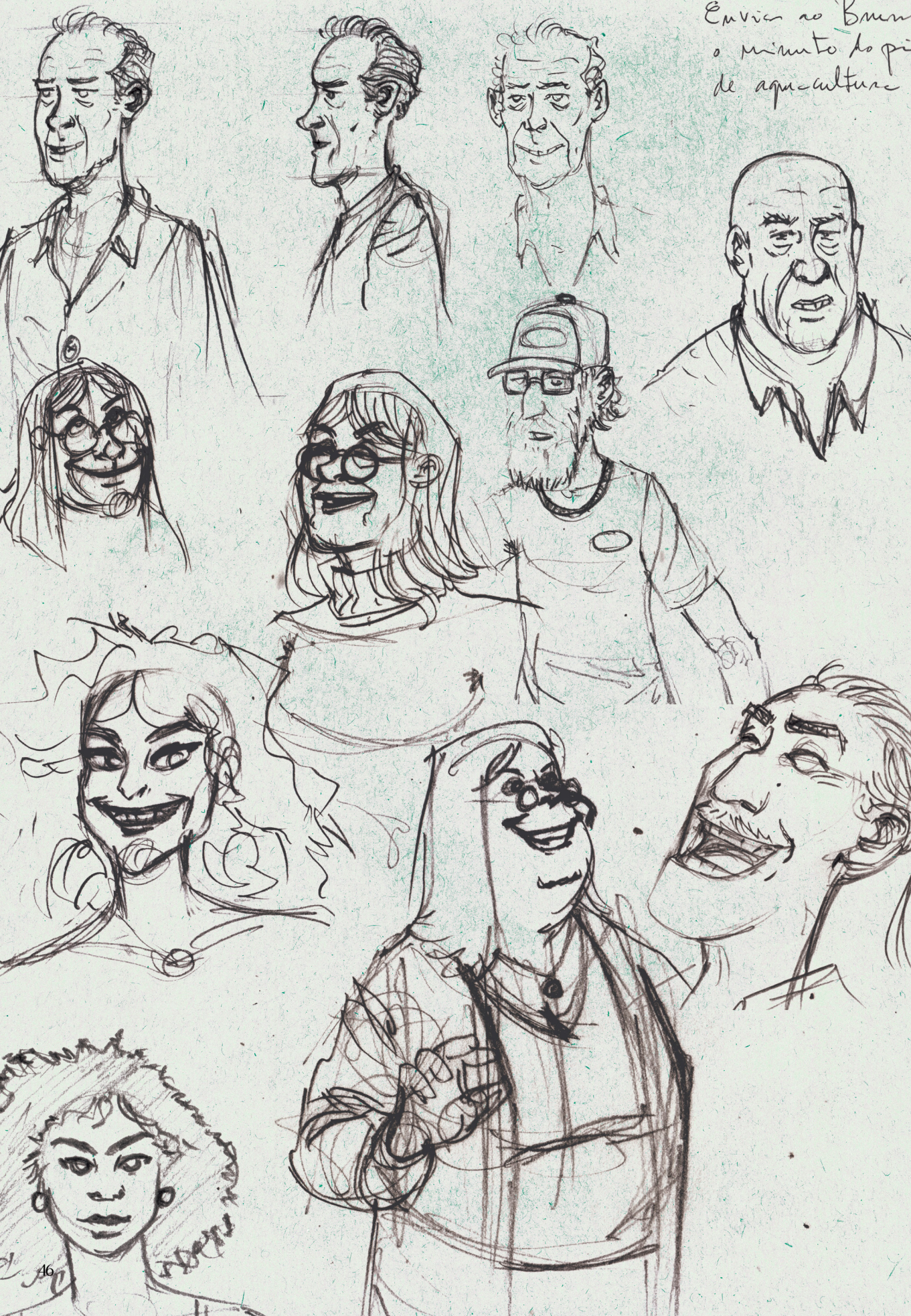




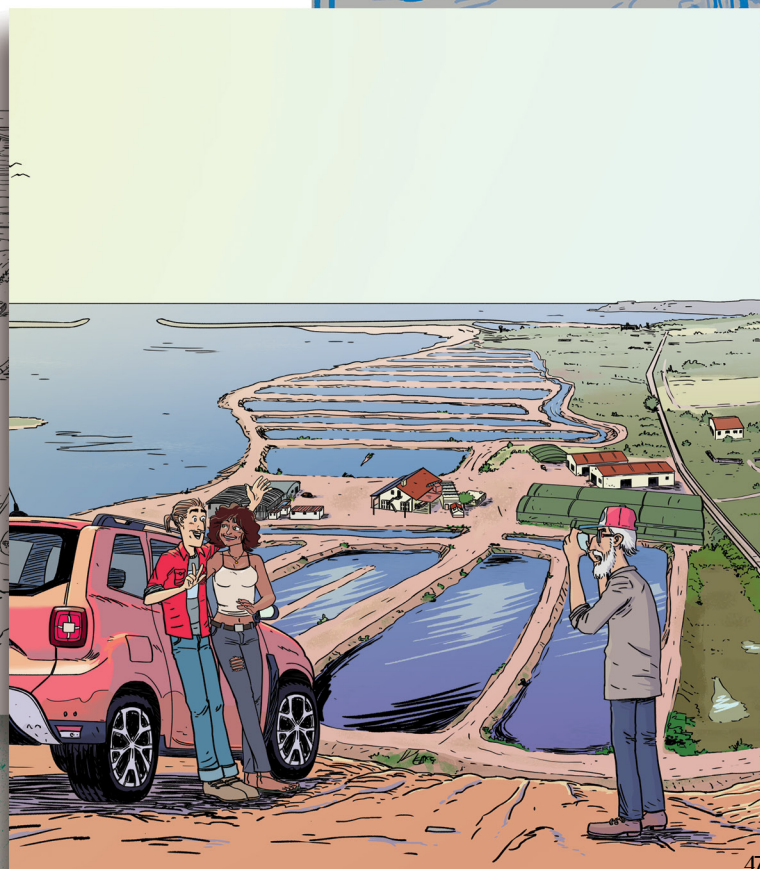
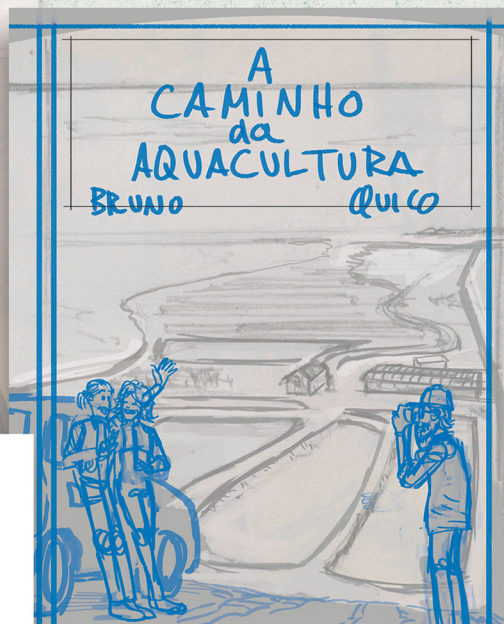
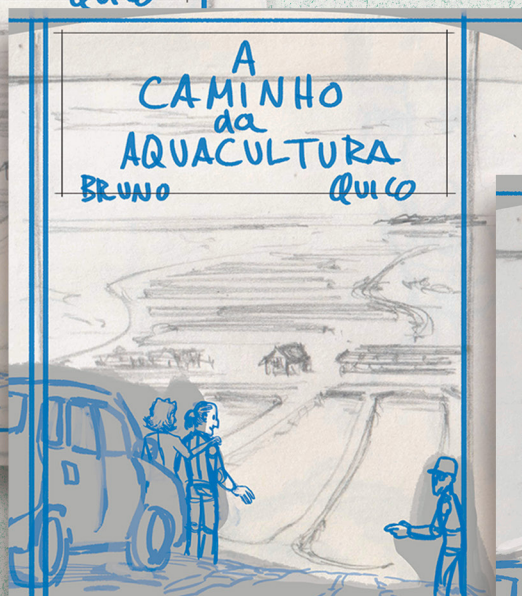
[illegible]



Envia ao Bm  
o minuto do pi  
de aquaculture











FILIPPE



AURORA







AVÔ



AVÔ

