

Chapter 14

“Come and Dive” in Papua New Guinea: Surfing, Reefs, Paper Park MPAs and Marine Conservation Issues in PNG Beyond Sharks, Whales, Crocodiles, Seagrass and ‘Developing a Resource’



Abstract Coastal ecosystems worldwide are collapsing. In parallel, diving is a relatively recent but intrusive leisure activity of industrialization and its holiday society with a vast human footprint in the atmosphere, socially, on land and certainly under water. It was little pursued by humanity for millennia but never reached such an intensity and depths as found today, globally, e.g. as enabled by plastic and rubber gear, combustion engines, including sling shots made available to kids in supermarkets. The human pursuit of pristine wilderness—coral reefs and seagrass beds—remains ongoing, and Papua New Guinea (PNG) offers such waters and coasts. Here, the PNG diving, snorkeling and surfing situation gets put into a conceptual context of the modern ocean crisis, including ecotourism, neoliberalism, technical developments, charismatic megafauna, marine protected area (MPA) failures, sustainable development, climate change and sustainability governance.

Keywords Papua New Guinea (PNG) · Diving · Snorkeling · Surfing · Coral reefs · Marine protected areas (MPAs)

14.1 Introduction

Diving is an outdoor sport and a major industry, pursued worldwide (e.g. Cousteau, 1979; Jackson, 2013)! It's a relatively recent activity in the history of 'The Earth' (which should better be called 'The Ocean' because salt water covers it to over 70%; Cousteau, 1979). Throughout history, humans were mostly diving for food, without much gear nor really for fun. As practiced and promoted now, diving and surfing are leisure activities, as part of the wider industrial income scheme with holiday time. While widespread and bringing tourists 'under water' worldwide, snorkeling and diving flourishes specifically in tropical areas and coral reef regions, seeking specifically pristine waters, new depths and thus increasingly remote areas to explore (Cousteau, 1979; Jackson, 2013). It's similar now to mountain climbing and seeking the extremes and unexplored extending the human niche.

The 'Coral Triangle' region—which PNG is part of—is world famous for its marine beauty (e.g. Stone & Obura, 2013) but also it is affected by tourism and

heavily threatened by climate change and the ocean crisis overall requiring better management concepts (e.g. Pitman et al., 2020).

New Guinea presents us with a key market area for diving, e.g. for affluent clients from nearby Australia, Asia (Singapore, Hongkong, Taiwan, Japan, etc.) and essentially from all over the world, including EU. PNG is famous for its coral reefs and remote islands (e.g. Lonely Planet Guide; <https://www.lonelyplanet.com/papua-new-guinea>) while on the Indonesia side, the Gam Island and its surrounding famous karst islands (Raja Ampa) are among the world’s richest reef systems in the world, and very popular for snorkeling and diving. New Guinea makes the deep earth’s diversity accessible just under the near surface water (Beehler & Laman, 2020, p. 28 for details).

Diving got more intensified and widespread with better plastic and rubber gear such as flippers, snorkels and goggles over the last 50 years. It extended the human niche into ever more and deeper waters (Jackson, 2013; see Cousteau & Richards, 1999, p. 205 for use of surgical rubber in PNG to fasten slings to their spears to make it more powerful and get a wider reach but wiping out more fish). While it pushed out even more sensitive marine wilderness creatures, it brought in many invasive species also. And this trend certainly got a major boost with the world-famous Cousteau’s Aqualung apparatus after WW2 (<https://www.cousteau.org/legacy/technology/aqualung/>); Jacques Cousteau made it happen and provided the tools, and thus, he came early to PNG to apply these techniques further in a unexplored marine wilderness (<https://www.cousteau.org/legacy/>; Cousteau, 1979; Cousteau & Richards, 1999). It opened up a new world and an ecological niche for humans to explore for fun and commercialization: They can stay longer under water, dive deeper, get closer to marine creatures and explore and exploit more! But in return, this left Mother Earth with a major human footprint, now even found deep under water at the most remote sites imaginable. The Australian Great Barrier Reef adjacent to PNG, and closely related, shows us no other, e.g. Roupheal and Inglis (2001). The human footprint is now widely recognized even within the diving industry and its promoters (Jackson, 2013; see Halpern et al., 2015 for Global Ocean Footprint overall) as it spoils their own experience they are affecting.

The marine life of PNG is still stunning in its own right, from clown fishes to groupers, many species of fusiliers, chama shells (operated for wear and jewelry; Beehler & Laman 2020; Cousteau and Richards, 1999) or the scorpion fish (with toxic needles, if not careful one can walk into those). See Blaha et al. (2016) for an example of genetic diversity not even being fully recognized yet based on crayfish sampling; much more can be expected in other taxa.

And there are many islands to explore in PNG, and Cousteau and Richards (1999, p. 271) showed for one of the outer islands of PNG—Wuvulu island—fascinating killer whale experiences with unique behavior patterns.

Diving easily convinces anybody who can afford to do it in person; others watch it on TV or read the colorful coffee table books (Cousteau, 1979; Cousteau & Richards, 1999). Diving is a global mainstream activity. Once this sport became popular, PNG was visited early on by recreational divers and promoted worldwide as ‘the new thing’ via media to most homes of the world, e.g. through the Jacques Cousteau family and their TV teams (supported in France, with subsidies and with U.S. media contracts worldwide; Cousteau, 1979. For specific PNG expeditions, see Cousteau & Richards,

Table 14.1 Selection of major globally relevant marine areas and dive sites elsewhere

Site	Location, nation	Outstanding feature	Conservation status
Maldives	Indian Ocean	Underwater reefs around islands	Climate change problems, sea level rise
Red Sea	Egypt/Israel	Coral reefs	Coral bleaching, overuse including ship traffic
Belize	Caribbean	Coral reef	Invasive species, overfishing, climate change impacts
Papua New Guinea	PNG	Coral reef and islands	Overfishing and contamination
Great Barrier Reef	Australia	Coral reef	Various, mining contamination, coral bleaching
Galapagos	Ecuador	Cold current	Invasive species, tourism

1999). PNG reefs are of world esteem. It markets itself as one of the last pristine, untouched reef areas in the world, equally or better than the Great Barrier Reef in adjacent Australia (e.g. Jackson, 2013; see Cousteau & Richards, 1999; Beehler & Laman 2020 for an environmental and wider perspective).

The coastline, coral reefs, beaches and remote sites and islands of PNG are simply a major experience for anybody to see and to explore with a conservation and humanity perspective. Rightly so, it finds itself in the travel office catalogues as one of the last wilderness places left in the world, exotic and it's all found right under the ocean surface, just waiting to be explored for anybody who can come there (e.g. <https://walindiresort.com/>; <https://www.facebook.com/niuginidivepng/>).

But while these diving sites are promoted as a 'fun place,' the ecological services that those reefs bring are vast. It's serious. Mankind cannot live without it. It's fragile, sophisticated and simply nothing to be played with really (Table 14.1). In the meantime, PNG is wild but actually lacks some relevant diving infrastructure e.g. high-powered hospitals and diving (de-compression) chambers nearby dive sites, emergency flights 'out' can be remote and long.

These sites are a major seascape wilderness. But in parallel, it also fragile and starts to get compromised increasingly. That's a global feature found with most diving sites, where resorts get promoted (Jackson, 2013). Those resorts tend to be set up by the wealthy, and where the wider public is essentially excluded, while a larger workforce stands ready to serve the paying tourists. There is no free lunch in that business unfolding on the wider public good of the reefs (Fig. 14.1).

PNG is affected by the Wallace Line, and the Weber Line (specifically for fish; Beehler & Laman, 2020 and citations within). Another reason why PNG is so fascinating for its marine life simply is its geography and related remoteness. For long time of the earth's history, it was secluded and thus was left alone; and before the 'aqualung,' nobody really ventured into the deeper underwater ecosystems, ever. PNG and its waters are simply new and exotic to the western world and western eyes; the Europeans are not used to coral reefs and thus mishandle them. Even in colonial times, that aspect was widely untouched, e.g. due to the lack of the aqualung!

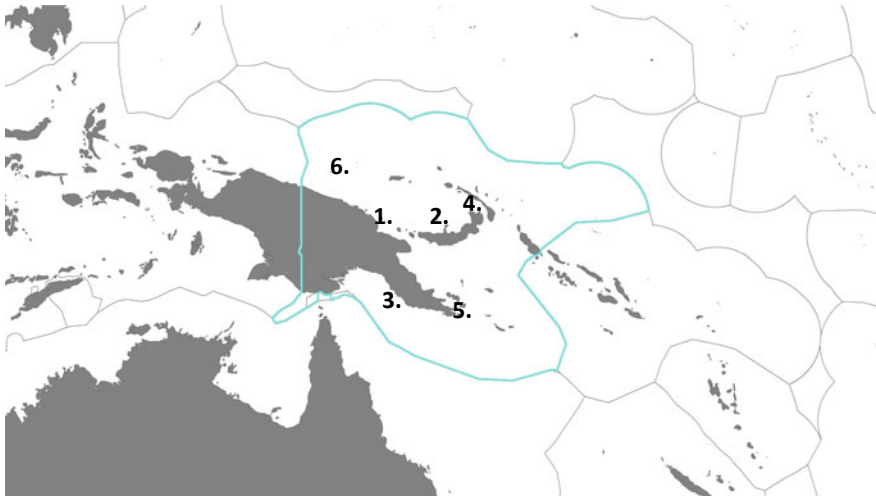


Fig. 14.1 Map of selected diving areas in Papua New Guinea 1. Madang, 2. New Britain, 3. Port Moresby area, 4. Kakopo, 5. Milne Bay region, 6. Wuvulu Island. Map also shows the EEZ of PNG (in blue)

Another reason for being let alone is PNG’s fear factor (“cannibals”), and then, a third reason is the connection ‘*Ridge to Reef*’: Tropical rainforests produce much nutrients, and together with the rainfall, it flows downhill and into the ocean, mixing, and that way feeding the currents and subsequently some reefs (e.g. Carlson et al. 2019). While this is a great support of the reefs, the downwash from the slope now spoils reefs and such habitats spoiling the ecology of the region. Other factors favoring biodiversity come to play also, e.g. ocean currents and the tropical location near the equator/sun.

But it is very important to state that it should be ‘*Ridge to Reef, and back.*’ Because whatever happens on the watershed shows up further below in the ocean and vice versa (for examples see Cousteau & Richards, 1999). It’s a main topic for any forestry activity in such areas, certainly in PNG (see Delevaux and Stamoulis 2020 for management).

14.2 What Do the ‘Sea Around Us’ Data Tell Us? A Nation-State Overfishes

A good source for any fisheries and EEZ data is the ‘Sea Around Us’ project (<https://www.seaaroundus.org/>). It shows for instance that the reported fisheries catch data on public record reported from PNG carry a reliability of ~1.1 (ranking from 4, the highest, to 1, the lowest). That does not instill much trust. But it’s obvious from those records that tuna presents the largest harvest; skipjack and yellowfin tuna are

sought after as a global commodity. Further one can see very well when a ‘sustainable fisheries’ was started—statehood in the 1970s—and what it means: very high fishing rate, done in a boom-and-bust cycle. This can hardly follow maximum sustainable yield equations, or any good stable plan with a longer vision and stable approach and oversight. Arguably, the local artisan fisheries—as a major item in Melanesia—are not even included, nor are species like mother-of-pearl, giant clams or even herring-type fish. It simply makes the case that these data show us a vast underestimate of impact, albeit a very grim one.

14.3 Seagrass Anyone?

As one ocean habitat of many, the remaining seagrass beds are a main asset of PNG; they remain widely unassessed and but get now increasingly affected. Perhaps there are up to 13 different species in such beds of ‘seagrass’ (MacKenzie et al., 2021). It was also shown that those seagrass beds can be a singular plant clone, and thus perhaps are one of the largest plants in the world (Edgeloe et al., 2022). While the visibility in seagrass beds can be ‘sanded,’ they are the nursery grounds for fish and sea turtles for instance. An increased sedimentation has been observed in seabeds, e.g. due to watershed run-off and mining (details in Cousteau & Richards, 1999). Over-fertilization is an associated problem in such ancient seagrass beds. Much of the freshwater inflow comes from water sources downhill originating from mountain forests and feeding the adjacent reefs. With alluvial mining as a major mode of operation in PNG, this cannot be good news for seagrass beds, or beyond (see for instance Wise et al., 2011 for sperm whales being contaminated in such ocean regions). Those seagrass beds are vast and provide a massive ecological service to the world, certainly for the marine life! But those are not well studied, mapped or protected in PNG. It’s a global heritage though and worth a diving trip indeed.

14.4 Come and See the Last Mangroves

Mangrove forests are on a massive decline worldwide (Sandilyan & Kathiresan, 2012); same applies now to PNG too. These coastal forests are simply cut down and get occupied by people and projects. Mangroves of New Guinea still exist in large coverage (Beehler & Laman, 2020). Mangroves are known to be large carbon sinks (Bouillon et al., 2008 for a discussion and relevance), as well as habitats, e.g. for birds, fish and turtles, as well as dugongs. Mangroves have vast ecological services. But while having been there for millennia, mangroves got in the way now, e.g. for development. It’s commonly used too for fire wood. Like with regular forests in PNG, mangroves are not well mapped, inventoried and looked after.

14.5 Estuaries to Watch for

There are a few very large estuaries in PNG where rivers discharge in the ocean. The outflow creates a ‘plume’ which presents a consistent, dynamic and very sediment-rich nutrient flow into the wider ocean waters; a mixing regime offers vast resources for sustainable fisheries. It’s those estuaries that are marine hotspots connecting with many other places in the Pacific, e.g. for migratory seabirds. And it’s no wonder then that people live in such productive areas for a long time. And they live there well. Such estuary locations are found throughout PNG, e.g. the Fly river, the Sepik river or the Ramu river, as the three largest outflows in PNG. Those are classic entry points for people to get into interior PNG (see for instance Sauer, 1915 for German explorations of the Ramu river system in colonial times). However, with increasing river pollution, e.g. Fly river from the Ok Tedi mine (Kirsch, 2014), and the Sepik river also now covered with invasive species (Cousteau & Richards, 1999) those plumes and their food resources can become a hazard; they got spoiled. And added by ocean pollution and climate change things do not get any better for the estuaries and their food chains. While those estuaries are very muddy and come with sharks and crocodiles easily spoiling a diving trip, PNG’s estuaries are special habitats to be protected, but lack most of the suitable efforts to do so. In the meantime, waterways that can be navigated will certainly have ship traffic, including tourist cruise boats on the Sepik or the Fly.

14.6 “Surf the Waves”, as a New Participator in the Neoliberal Utilization Scheme of the PNG Oceans

Hawaii, Tahiti and California are traditional hotspots of the world surfing world; Australia and other sites followed suit (with few exceptions like Normandy/France and Portugal surfing is not so widespread on the Atlantic side but on the rise, like in Nova Scotia, Canada in winter). While it’s a fun ‘outdoor’ activity, it actually has quite a commercial undercurrent and is a wider and intense business model. Surfing was likely a bit ‘anti’ but now got used for ‘development,’ virtually anywhere, e.g. from Alaska and Nova Scotia in winter to Nicaragua (<https://www.surflife.com/travel/nicaragua-surfing-and-beaches/3617476>), and Papua New Guinea (West, 2014). One can easily find now ‘new’ surf beaches in Wewak region, Sepik, and some surf dudes start to use them; all connected by Australian airlines (usually facilitated by including surf boards cheaply in the airline ticket) While it might have a rel. little environmental impact, it certainly has a social and carbon one. Surfing and those surf dudes are now part of the neoliberal ocean portfolio, and it’s commercially serving a few investors and entrepreneurs, including hotel owners.

14.7 PNG as a Cheap Labor Operation for Diving and Surf Resorts and Others Work Places

And lastly, the pricing of a PNG diving trip is to be seen in the wider global context: PNG staff has little union power and a marginal salary in a nation that already ranks among the poorest in the world. The minimum salary per hour is app. 4 Kina, and per week it would be c. \$160 US per month. That makes great business; a win-win...for some (for the tourists and for the operator abroad: but PNG tends to lose, including its economy). The large resorts are usually surrounded by villages, readily providing the labor for those resorts. It's the other side of the coin. The manpower needed for such resorts are linked to staff and kitchen personnel for instance, whereas the management and ownership remains outside of PNG and where the real money is made. It comes by design.

14.8 Sustainable PNG as the Treasure Trove

Some might see this (marine) biodiversity wilderness as a large treasure trove for the world's species richness, but it also is one for biomass and ecosystem services, and thus, a sustainable management of food and fisheries resources. And that's precisely what has happened in this region for over 47,000 years, e.g. PNG and Torres Islanders and the Great Barrier Reef (Table 14.2; Fig. 14.2).

This treasure trove gets exploited, as per the means available. Pirates were few, but 'beach combers' and escapees from the western colonial system are known there for a long time (for some statistics for northern PNG see Mayr & Diamond, 2001, p. 30). Dynamite fishing was commonly applied in the 1970s and earlier (Pauly et al., 1989, see Cousteau and Richards for details and amputees who tried to re-use war dynamite from WW2). The legacy of dynamite fishing left many victims, not only

Table 14.2 Components where PNG waters are still world leading

Marine feature	Justification	Citation	Ecological relevance
Seagrass	Large areas left and little disturbed or studied	e.g. Beehler and Laman (2020)	Global importance for ecological services
Mangroves	Large areas left		Global importance for ecological services
Islands	Vast number and diversity	e.g. Mayr and Diamond (2001)	Diversity, biogeography
Pristine waters	Relatively little industrialization	FH pers.com	Global importance for ecological services
Tuna	Rel. high abundance compared to other ocean areas	FH pers.com	Food chain

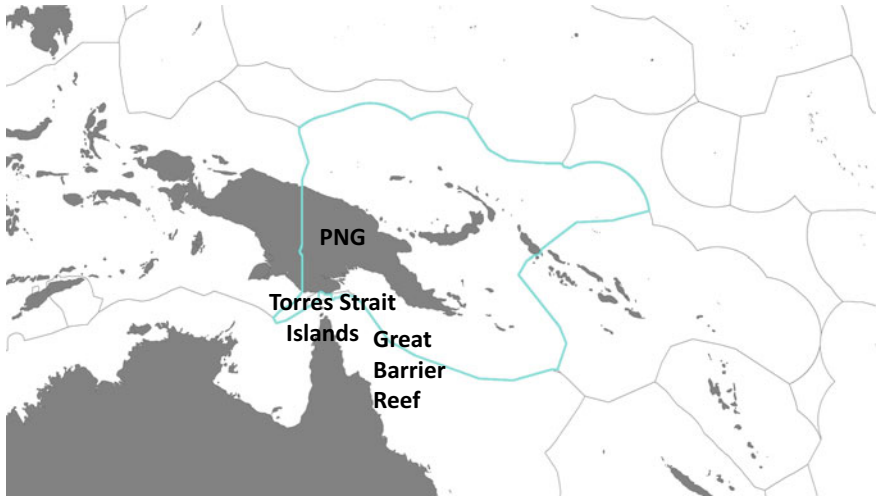


Fig. 14.2 Papua New Guinea in relation to Great Barrier Reef and Torres Strait Islands; all of those are major habitats of global relevance and with indigenous groups and civilizations co-evolved for millennia

reefs and ecosystems, but also for the wider impact and ecosystem. Many problems from this can be seen today.

Other ‘modern’ forms of exploitation and business concepts can widely be found beyond seafloor mining. For instance, sea cucumbers get caught in PNG and sold in Singapore, etc., with a tenfold gain (Cousteau & Richards, 1999; see Hair et al., 2019). What does such a business result into? As can be seen in the easily accessible traditional ocean resources (Hyndman, 1988; Hair et al., 2019), a shift from traditional village business models to new exploitive ones will make the natural resource and its sophisticated sustainable management expertise simply ‘go away.’ Shark-calling is among those, so is giant clam gardening, beyond many others.

14.9 Harvest a Crocodile, Eat a Dugong, Some River Dolphins and Others

PNG was famous in the 1960s and before for its (swamp) crocodile harvest (e.g. Bolton et al., 1982). And saltwater crocodiles (Webb et al., 2010) reached record trophy sizes. It was part of the colonial exploit. But those harvest rates are now in the massive decline, if even that (Daltry et al., 2016). That is true for their abundance and their size; a clear symptom of their demise, just like elephants with big tusks are on the way out these days, or large land and sea turtles, or large mammals.

For Dugongs, those are not so easy to see anymore neither. One can sometimes find hunted penis bones on PNG markets (see previous chapter of this book). Whereas in Torres Islands—with a more direct Australian oversight—those next to PNG underly

a more stringent regime and IUCN monitoring (Heinsohn et al., 2004) but remain very dubious for conservation effectiveness.

The status and narrative of river dolphins is another poor one anywhere in Asia (see Beasley & Brown, 2018 for Snubfin Dolphin in Australia and PNG). Those species are difficult to detect and to count, and thus to conserve. But it looks clear that those habitats are getting compromised and that their species are fading out also; like most river dolphins do these days. It’s part of a wider trend found all over Asia and the world for such species (see Huettmann et al., 2020 for Ganges Dolphin & Huettmann, 2020 for China), with the richest countries having the worst records, e.g. China, Brazil. See also details on marine mammals with Mavea et al. (2021) and recent associated seabird species (Rayner et al. 2020).

14.10 And Where Are the Sharks Now?

Many divers are attracted by sharks, and vice versa. Like with so many other ecosystem components, without sharks, the tropical oceans are less relevant, hardly viable. Once sharks are gone, humans will be next. And the sharks are going... involuntary as they are overharvested. The global shark decline is for real though (Ferretti et al. 2010, Worms et al. 2013), and PNG is no exception (Beehler & Laman, 2020; The Guardian, 2022). With big ocean predators in stress, or decline, one sees a rise of slime in many oceans now.

With PNG being a shark fishing site, it’s very noteworthy to look at the underlying structure how this all happened, who did it and who was responsible, and what does it mean for the foodchain structure overall!

PNG has a long tradition to catch sharks (shark calling; details in Cousteau & Richards, 1999; The Guardian, 2022 for seabed mining impacts). But clearly, the decline of sharks was not a PNG job, instead it came through the global and Asian demand of shark products, also fueled by a western market offering, e.g. Canada and Europe (Beehler & Laman, 2020). But then it got intensified with globalization and other overfished stocks while shark stocks are generally on the decline already (Butler et al., 2014; Vieira et al., 2017). In this regard, the mislabeling of sharks on international markets for fish products should be stated also (Pazartzi et al., 2019; it’s quite common in fisheries and food markets anywhere though, including meat an on honey products).

14.11 “Come and Dive” to See the Deckchairs of the Titanic, in a Designated MPA and Outside...

While the oceans are in a global crisis, PNG remains a jewel to explore, including sunken ships and war planes shut down during WW2 (‘wreck’s; Cousteau and Richards 1999 for photos and details). But PNG also shows similar ocean problems than found in many other places of the world. Other than fish, the aforementioned Sea Around Us project for instance shows 93 vertebrate species for PNG; and that’s arguably still an underestimate. Most of them remain unstudied, some undescribed.

Let’s have it protected then! Well, for that ocean area prioritization is called for, and then trying to locate hotspots to be protected... However, that widely used narrative fails on many grounds as it ignores the wider ecological connections required for such hotspots to function. Ocean hotspots cannot stand by themselves and in a vacuum. Many of the marine protected areas (MPAs) are ‘paper parks,’ as they have little budget and very poor enforcement records (see Buckley, 2020 for concept and terrestrial examples in Asia effecting rivers, estuaries and oceans). Secondly, many MPAs are not ‘no-take’ zones (protected) as people often believe, e.g. as known for most terrestrial Nationalparks. But rather allow a ‘take’, e.g. fishing (the commercial lobby would otherwise hardly agree with those efforts). Third, in PNG, mutual ownership drives the resource (Hyndman, 1988), and thus, an exclusive national park concept such as a MPA hardly gets a wider buy in. It fails almost anywhere else in New Guinea (Beehler & Laman, 2020). Fourth, even if a good outcome can be planned, it will take at least another 20 years for good progress outcome. For the fastly changing coral reefs, likely that is too late. The various ongoing MPA efforts in PNG—a world-relevant resource after all—must simply be seen in that light (Green et al., 2009; Hamilton et al., 2009; White et al., 2014). And the latest western trend of zoning will unlikely make it better; options remain few. PNG waters are on a same trajectory as outlined by Jackson et al. (2001, 2013) globally: a collapse. And with that ecological collapse comes a human collapse (Diamond, 2011).

In conclusion, diving in PNG remains a major experience of nature, of the marine life of Mother Earth, of PNG and of one’s own soul. It’s a life changer to most people who can afford it, while conservation management on an efficient level with a good vision is widely absent (Pittman et al., 2020) and currently it cannot achieve what it sets out to do. How to carry it out sustainably remains unknown and is not promoted hardly asked for by practitioners or a take-home message even; it’s an abyss.

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