



School of Biological Sciences  
FACULTY OF SCIENCE

Assoc. Prof. David C. Paton AM

BENHAM BUILDING DX650 312  
UNIVERSITY OF ADELAIDE  
ADELAIDE SA 5005  
AUSTRALIA

TELEPHONE +61 8 8313 4742  
FACSIMILE +61 8 8313 6222  
david.paton@adelaide.edu.au

12 October 2018

Hon David J Speirs MP,  
Minister for Environment and Water,  
Parliament House,  
Adelaide SA 5000  
david.speirs@sa.gov.au

Dear Minister,

I write to express my grave concerns for the health of the Coorong and to re-iterate that the current degradation is a consequence of releasing water drained from adjacent agricultural land. This relatively fresh water is being released into the hypersaline southern end of the Coorong at Salt Creek. These releases are changing the ecological character of the southern Coorong, threatening the food resources of migratory and non-migratory birds, and restricting their access to food resources. This is contrary to the EPBC Act. This Act includes international obligations under the Ramsar convention and various migratory bird agreements.

I wrote to the Premier of South Australia in early April 2018 (6 months ago), expressing my concerns about the Coorong and these unnatural flows. I have not received any response. I also wrote to Philip Glyde (Chief Executive, Murray Darling Basin Authority) at the same time expressing my concern about the current flows and the proposed additional flows that formed one of SA's SDLAMs (Sustainable Diversion Limit Adjustment Mechanisms), as part of the Murray-Darling Basin (MDB) Plan. This letter was written because a submission in as part of the formal SDLAM consultative process in November 2016 was ignored. In his response to me, Philip Glyde responded saying that my concerns were forwarded to your department for a response. Six months later there has still been no response.

There are six questions that I seek your response to:

- 1) Why is South Australia not honouring our obligations under the EPBC Act and continuing to turn a blind eye to the ecological damage being inflicted on the southern Coorong by unnatural releases of water at Salt Creek?
- 2) Why is your Department still releasing water into the southern Coorong?
- 3) Why is your Department planning to release even more water into the southern Coorong, despite the likely added impacts on the Coorong's unique ecological character and claiming this as an SDLAM?
- 4) Why is your Department ignoring the scientific evidence and replacing this with opinions in making decisions that affect the well-being of the Coorong?

- 5) Has South Australia done a deal to trash the Coorong by releasing water into the southern Coorong, so that the equivalent volume can continue to be used for consumptive use elsewhere within the MDB?
- 6) What are the consequences for a Minister and senior public servant advisors in the Department for being selective in the information used to justify decisions that are detrimental to a wetland of international importance, a wetland whose ecological character is supposed to be protected under our laws, and international agreements?

I suspect that much of the evidence is being ignored, that decisions are based on unsubstantiated opinions, and that certain interests are being favoured at the expense of the Coorong. This post-truth discourse, where experts are dismissed, and alternative facts and opinions endure, has to stop.

With respect to the questions raised above I will now (i) provide summaries of the evidence and, where required, (ii) draw your attention to (a) the state's obligations under various approvals; and (b) the inadequacies of the documentation used to seek approval for the SDLAM known as the South East Flows Restoration Project (SEFRP).

#### Salinity in the southern Coorong.

The primary argument used to justify the release of water drained from agricultural land into the southern Coorong was a need to reduce increasingly high salinity in the southern Coorong. There is, however, no evidence that the salinity in the southern Coorong has increased significantly over decades and longer. For example in the late 19<sup>th</sup> century (i.e. late 1800s) the salinity at the junction of the two lagoons was greater than two times the salinity of seawater (McCourt & Mincham 1987, pp 173-4; i.e. >75 g/L). Such a salinity is typical of the salinities recorded in the 1980s, 1990s and 2010s for this part of the Coorong. Kotwicki and Clarke (1990) reviewed the evidence of rising salinities in the southern Coorong, and concluded that there was no significant increase. They largely used data collected in the 1980s but those salinities were similar to those measured in the 1990s, into the early 2000s and again in the 2010s. A typical salinity range for the southern Coorong in spring is around 40-50 g/L at the northern end to 60-70 g/L at the southern end, but by the end of summer those salinities may typically range from 80-100 g/L in the north to around 100-120 g/L in the south. This does not mean that the salinities will always sit within these ranges as there can be times when salinities are lower, as in during major floods (unregulated flows) and higher, as in during extended periods of no flows over the barrages (e.g., the millennium drought). After those extreme events, the salinities quickly re-establish back within the typical range. If anything, salinities are now lower than might be expected due to releases of water at Salt Creek. So, in conclusion, there is no evidence that the southern Coorong needs to be freshened, and so no scientific justification to release water into the southern Coorong to counter rising salinities.

#### So where does the concern for salinity come from?

John Noye (1974, p 72) suggests that “there is apparent stagnation in the waters of the South Lagoon, indicated by mats of rotting water weed killed by excess salinities in late summer ... the dead water weed ultimately gets blown on to the shore where the stench produced as it rots is almost unbearable”. However, this interpretation is contrary to his evidence. If high salinity was killing the plants then there would have been few plants growing at the site to then be washed ashore to rot. Rather the plants were killed when water levels dropped in late summer. Water levels in the southern Coorong are around 1m lower in late summer than in spring. As water levels drop, aquatic plants growing in the shallow water around the margins of the southern Coorong become exposed, die and rot. This is actually a normal occurrence. There are comparable descriptions from the 1850s and 1920s to those of Noye, and the phenomenon continued in the 1980s, 1990s and into the 2000s (pers. obs.). The one difference, however, is that in recent decades water levels drop often abruptly in spring because the flows over the barrages rarely continue through spring. Historically, with less extraction of water for consumptive use in the MDB, substantial flows continued well into summer. The consequence of reduced flows is that less plant biomass accumulates before being stranded in spring compared with what would have been stranded in late summer.

Arguments for a greater diversity of fish in the southern Coorong historically, need to demonstrate that this was consistently the case, rather than simply being associated with the short periods of time when the salinities were lower, either seasonally, or because of the freshening that comes with unregulated flows.

So, as the salinity is typical of the southern Coorong, why is there a need for your Department to freshen it?

#### Historical flows into the southern Coorong

The second argument for promoting flows of fresh water being released at Salt Creek has been that regular and substantial flows used to enter the southern Coorong along Salt Creek. However the evidence for such flows is at best very weak.

Noye (1974, p 75) suggested that a loss of freshwater flows into the southern Coorong at Salt Creek had contributed to his contention of higher salinities. However, commissioned reports show that during the period of 1864 to 1912 there were only six recorded events of flows into the southern Coorong at Salt Creek during this 48 year period (see Jensen *et al.* 1983 p 78; Upper South East Dryland and Flood Management Plan (USED FMP) Steering Committee 1993 p. 83 for details). Importantly, this was a period in which flows were facilitated by significant earthworks. First, a 4 m deep cut was made through the dune between Morella Basin and Salt Creek in 1864. Second various drains and levee banks established closer towards Kingston in the late 1880s would have pushed more water towards the Coorong during the latter half of this period. Thus the estimate of flows at Salt Creek during this 48 year period, will if anything, over-estimate the frequency of flows entering the Coorong at Salt Creek. Even the most ardent proponents for water being released into the Coorong admit that the flows did not occur every year. So, why is your Department annually releasing drainage water and planning to release even more drainage water annually?

#### The stated ecological risks to the Coorong from the Upper South East (USE) Dryland Salinity and Flood Mitigation Scheme

To solve the problems caused by rising saline groundwater in the Upper South East of South Australia, various options were reviewed and decisions made to implement a drainage scheme to remove surplus surface water as well as some saline groundwater. The Coorong was selected to receive this water. The Environmental Impact Statement highlighted serious concerns about the consequences of these releases to the ecological character of the Coorong. These risks were that the drainage water would carry nutrients and heavy metals and these along with freshening, would favour algal blooms and be detrimental to the unique hypermarine environment of the southern Coorong (USED FMP Steering Committee 1993). These concerns were re-iterated by Paul Boon (2000), who was commissioned by the SA government to review the likely risks of the drainage scheme on the Coorong. Eventually, permission was granted by the then Federal Minister for the Environment (Senator Robert Hill) but with a series of conditions on that approval: primarily the releases of water were not to eliminate the unique hypermarine environment of the southern Coorong. These conditions were then reiterated and detailed in the letter of approval of funding to Mr Rob Kerin (Deputy Premier) from Warren Truss (letter dated 24 September 2001). Amongst the obligations were that the State monitor the hydrology and ecology of the southern Coorong and, if signs of adverse impacts were detected, then the South Australian government had to explore a marine outlet for the drainage scheme. (I refer you to conditions 1.1, 1.2, 2.1, 2.2 and 2.3 detailed with the approval letter). A subsequent request in 2006 to the Federal Government to allow the State to lift the volume of water that could be released was approved by the then Federal Environment (Ian Campbell) and Federal Agriculture (Peter McGuaran) Ministers. Their joint letter of 7 December 2006 to Gail Gago (SA's Environment Minister) re-iterated that the State needed to monitor the hydrological and ecological impacts of Upper South East water flows into the Coorong and, if conditions changed, this approval would need to be reviewed. In 2006, the MDB was in the grips of the Millennium drought and the added volume sought for release was intended to help counter extreme salinities. However, the extreme salinities were quickly re-set after substantial flows of water over the barrages returned in late 2010. Thus, the need to release as

much water as sought and approved was no longer necessary and the approval should have been reviewed.

Despite the requirement to carefully monitor the impacts of drainage water on the southern Coorong, the State invested little, if any, funding to specifically monitor the impact of these water releases on the ecological character of the southern Coorong. A relatively modest assessment of the nutrients in the water column was commenced in 2013, only after the first signs of filamentous algae appeared in the southern Coorong, some 12 years after the releases commenced. That study only considered the nutrients in the water column and often for just parts of the year and did not consider possible storage in the sediments and/or storage of nutrients in filamentous algae. Clearly the State failed to monitor the hydrology and ecology of the Coorong in a manner that enabled the impact of the drainage waters on the southern Coorong to be documented. Your Department now argues that the source of the nutrients and algal blooms are not known. This is not a justifiable stance to take given the State's negligence in not undertaking appropriate monitoring as required under the conditions of approval. Despite the obvious impact that these releases of water have had on the southern Coorong, the State continues to release this water. This is in contravention of the original approval. Why is the State continuing to release drainage water into the southern Coorong? At the very least, the precautionary principle should be applied and all flows cease. The precautionary principle is embedded within the Water Act and the EPBC Act. Why are you ignoring the requirements of these Acts?

One of the arguments used by your Department to allow the ongoing release of water into the southern Coorong was that filamentous algae were reported in the Coorong previously, so the ecological character has not been changed, citing work by Geddes in the 1980s in support of this. Geddes and Butler (1984), however, reported filamentous green algae only from the North Lagoon of the Coorong in 1982-83 and not in the South Lagoon, albeit their sampling of the South Lagoon was limited. The presence of filamentous algae in the North Lagoon of the Coorong is well known. For example, Womersley (1974) notes that filamentous green algae were common but were estuarine and calm water dominants.

I can add to these observations for filamentous green algae in the North Lagoon as follows. Filamentous green algae were present in 1992-3 at Noonameena when we were testing the performance of translocated plugs of *Ruppia tuberosa* across a range of salinities within the Coorong. In the much lower salinities at Noonameena in the North Lagoon, the algae attached to the *R. tuberosa* that we had translocated and subsequently prevented it establishing in the pots. No algae were observed and no algal interference occurred for similar pots of *R. tuberosa* deployed at intervals along the South Lagoon of the Coorong at the same time. In late 2010, the populations of *R. tuberosa* that established in the middle of the North Lagoon during the Millennium Drought were swamped by filamentous green algae when freshwater flows over the Barrages returned in late 2010. The populations of *R. tuberosa* were virtually eliminated within a year (as they had not succeeded in reproducing prior to the interference from algae). This is reported (and repeatedly so) in most of our annual *R. tuberosa* reports that we have provided to your Department since 2010. Filamentous green algae continue to be present in the North Lagoon mostly attached to the calcareous mounds of *Ficopomatus* and submerged reefs along middle sections of the North Lagoon but never at densities that resulted in extensive patches. This would seem consistent with Womersley's 1974 comment that these algae were common and indicative of some level of eutrophication but never sufficiently prominent for conditions to be considered over-eutrophic. In summary, there is no evidence of filamentous algae in the southern Coorong prior to the Upper South East drainage scheme coming into operation. Your Department, however, continues to suggest that filamentous algae were present in the southern Coorong prior to releases of Upper South East drainage water at Salt Creek, and thus cannot be caused by those releases. There is no evidence to support your Department's position.

So the question becomes, when did filamentous green algae first appear, and then become prominent, in the South Lagoon?

I know of no evidence of its presence during the 1980s, 1990s, or 2000s. This includes periods when we conducted sampling of *R. tuberosa* along the length of the South Lagoon during spring and or summer in 1984-85; 1990-1993 and from 2000 onwards. However in the early 2000s the

first outbreaks of filamentous algae began to appear in Salt Creek but not the South Lagoon proper (pers. obs.). This was a year or two after the first releases of Upper South East water via Salt Creek had begun. Our first records of filamentous algae in the South Lagoon proper were not until spring 2011 when filamentous green algae were detected in the South Lagoon at the northern end and also near the southern end (a few kilometres south of Salt Creek) but nothing detected in between. In all previous years, when we had conducted annual summer (January) sampling for *R. tuberosa*, there was no sign of any filamentous algae (i.e 1984-85; 1990-1993; and 2001-2011). By January 2012, there were small amounts of filamentous algae throughout most of the South Lagoon interfering with and or associated with *R. tuberosa*.

In 2012-13, we assessed the quantities of algae that accumulated on vertical 1 m x 1 m mesh traps over periods of about 3 months, for a 12-month period, at points along the South Lagoon and North Lagoon. In that year, more algae were trapped at sites in the North Lagoon than the South Lagoon but filamentous algae were present throughout the South Lagoon (as well as throughout most of the North Lagoon). Such a pattern is consistent with the lower salinities in the North Lagoon (cf South Lagoon) and algae doing better in lower salinities. In 2013, substantial volumes of water were released at Salt Creek (46 GL) and the algae has been prominent since (affecting all *R. tuberosa* beds), but it was especially prominent over the spring-summer of 2016-17, when the salinities were lower because of an unregulated flow in the MDB. In the spring-summer of 2016-17, the algae were so prominent that it covered the surface of most bays and filled the water column between the bottom and the surface at least out to depths of 1m. These outbreaks of extensive areas of filamentous green algae were throughout the length of the South Lagoon, and the southern sections of the North Lagoon but they were not prominent between there and the Barrages. So, although filamentous algae were present in these northern areas, there was no 'bloom', unlike the southern Coorong. This suggests the source of the nutrients that facilitated the algal bloom in the southern Coorong was from the southern sources of water (namely water released via Salt Creek) and not from flows from the Murray. That is not to state that there were no nutrients in the water being released over the barrages in spring 2016 but it was not sufficient to get a bloom of filamentous algae. Other marine algae (e.g. *Gracilaria*) were abundant in the northern sections of the Coorong though, including a lamina species of *Ulva* (sea lettuce) and these may have taken up some of the nutrients. There were also no filamentous algal blooms in the Lower Lakes suggesting that the nutrient loads of water coming in over the barrages were not sufficient for a bloom, despite the salinities being more favourable for filamentous green algae in the northern Coorong. All of this suggests that the source of the nutrients that facilitated the bloom in the southern Coorong was the water being released via Salt Creek, where filamentous algae was also present in the water being released.

Given that the South Lagoon holds between 90 GL (late summer, autumn) and 150GL (winter and early spring), regular releases of 12.5 GL per annum of water at Salt Creek (the average volume releases over the first 17 years of the USE drainage scheme) carrying even a modicum of nutrients over 15 or more years could result in an accumulation of nutrients comparable to the concentrations in the drainage water (or more), especially given high evaporation rates over summer. Thus the logical source and simplest explanation of the blooms of filamentous green algae in the southern Coorong is that these blooms are a consequence of releases of nutrient rich water at Salt Creek. Science works on parsimony – the simplest explanation being favoured. Given that this outcome was flagged as a potential risk prior to any drainage taking place (e.g., USEDMP Steering Committee 1993), and reinforced in a subsequent review by Boon in 2000, the State Government cannot then suggest that other factors might be involved (particularly as the State Government did not invest in rigorous monitoring to detect any changes). Boon in fact indicated that blooms of filamentous algae might be delayed until the quantities of nutrients had accumulated sufficiently; he even suggested that the blooms would likely involve the algal species of *Enteromorpha*, *Cladophora* or *Ulva*. So, exactly what was predicted has happened. However, your Department does not accept that this is caused by releases of water at Salt Creek and instead suggests a study of nutrient dynamics is now required to understand what has happened before any changes to releases would be considered. This is rich given that South Australia ignored the requirements of the original approvals for the Upper South East drainage scheme by failing to implement effective hydrological and ecological monitoring from the start. Rich also in that it ignores the obligation to find a marine outlet for the water should there be adverse outcomes for the Coorong. And, finally, rich in that the State continues arrogantly to release more water

irrespective of likely negative consequences for the ecology of the southern Coorong. Your Department and South Australia, in general, continue to ignore our international obligations to protect the Ramsar-listed ecological values of the Coorong as required under the EPBC Act.

#### The South East Flow Restoration Program.

In seeking approval for the release of additional water under SEFRP into the southern Coorong your Department states that there is no risk to the ecology of the Coorong of releasing more drainage water. Given the evidence above, this beggars belief. How can your Department indicate that there is no risk? And, why does it continue to do so? Has your Department considered the impact of additional releases on the ecological character of the southern Coorong, including *Ruppia tuberosa*, chironomids and waterbirds, including migratory shorebirds? If not, why not? All of these characteristic features are jeopardised by releases of freshwater at Salt Creek.

These flows cannot be justified on the ground that they are restoring historical flows as the original flows were infrequent and not annual. Furthermore the modelling conducted in the 1990s by Gary Tong (e.g. Computational Mechanics International Pty Ltd 1992) as part of the Environmental Impact Assessment for the USE drainage scheme indicated that salinities would drop and that over a period of 10-15 years of releasing volumes of around 40 GL per annum the salinities at sites along the South Lagoon of the Coorong would be consistently around 40 g/L or lower. The southern lagoon of the Coorong would become estuarine and the unique biota adapted to, and flourishing, in the hypermarine South Lagoon would be lost. The USE flows (12.5 GL per annum on average) coupled with the proposed annual releases from SEFRP (26.5 GL per annum) approach 40 GL per annum. How can your Department say that there is no risk to the ecology of the South Lagoon with the SERFP? Simple arithmetic informs us that influxes of ca 40 GL (about 25% of the volume of the South Lagoon when full) will freshen the system within a few years, and when that occurs (if not sooner) other unique features will be lost. For example, the gradient of increasing salinity from north to south, a feature prominent in the salinities measured since the 1960s will be lost more quickly. In fact, the salinities in the southern Coorong (south of Salt Creek) were actually lower than those at the northern end in late September this year, so that gradient has already been altered. How can your Department continue to hide these changes when seeking approval for further releases of drainage water? Why are these risks to the Coorong not communicated to the people of South Australia, who care about the health of this wetland of international importance?

Please note too that releases of water at Salt Creek do not raise water levels to any real extent (ca 5 cm) and so do not address a fundamental issue for the southern Coorong which is the premature drop on water levels in spring that now exposes *R. tuberosa* before it has reproduced.

I realise that the concerns I am raising are the result of decisions made by previous Ministers but you have an opportunity to act in the interests of the Coorong, to show genuine leadership and to leave a positive legacy as far as the Coorong is concerned. There has been a long history for calls to invest in long-term (decadal length) research to better understand the Coorong so that it can be managed and conserved for future generations and so enable our international obligations to be met. Those calls date back to the 1970s (e.g. Noye, Womersley), over 40 years ago. In December 1984, the then Minister for Environment and Planning (Don Hopgood) and the then Minister for Water Resources (T. Staler) placed a 10 year moratorium on any drainage schemes or other infrastructure proposals (e.g. a connections between Lake Albert and the Coorong), until ecological and hydrological studies of the Coorong were undertaken, but the state did not invest to any extent. The State was also obliged to invest significantly in research that investigated the impacts of the USE drainage scheme on the hydrology and ecology of Coorong but failed to do so. At best the State provides small levels of support for short periods of time that never provide the breadth and depth needed to generate the knowledge needed to manage the system in the future. Such investments are also reactionary to specific concerns, rather than being holistic.

I am aware that you are looking at opportunities to invest in research in the southern Coorong again for a short period of time (3-4 years) as a consequence of the recent perturbations to the ecology and integrity of the unique hypermarine systems of the southern Coorong. These too, will not provide an adequate basis for holistic management because only some components of the

system would be studied, and no doubt, like previous studies the funds are largely sought from the Commonwealth. South Australia has shown and continues to show little interest or capacity for investing in understanding the ecology of the Coorong let alone the other Murray Darling Basin wetlands in South Australia. These wetland systems continue to decline as a consequence and in 10-20 years we will be no better off. I have previously mentioned that the State should seek significant funding from the Federal Government to establish a South Australian River Murray Institute to drive the research and innovation needed for this State to salvage what it can from the likely inadequacy of the Murray Darling Basin Plan. I have sought to meet with either yourself or senior executives within your Department to advance an Institute proposal. This is something that you could establish and leave as your legacy. For various reasons no meeting has been arranged.

I note with concern that your Department, no longer, shows any interest in engaging with me. Presumably because my views differ from those of you and your Department. My views are, however, based on (i) a long history of monitoring the ecology of the Coorong (spanning more than 30 years); and (ii) being aware of the various scientific reports (often done by or for your Department or its equivalent) dating back to the 1960s, many of which are being ignored. The above provides an overview of my position. My position has not changed and will not change. You have stated that you want the management of the Coorong to be based on science (evidence). You have also stated that you want more South Australians to connect to the environment so that they will fight for its protection. I am fighting for the Coorong's protection now. At the very least you and your Department, and the State Government as a whole, owe me the courtesy of responding in a timely fashion to my concerns.

Yours sincerely,

David C. Paton AM

Associate Professor  
School of Biological Sciences  
University of Adelaide.  
Adelaide SA 5005  
david.paton@adelaide.edu.au

Cc

Hon Josh Teague MP;  
Dr Susan Close MP,  
Hon Mark Parnell MLC,  
Hon Rebekha Sharkie MP,  
Hon Mark Butler MP,  
Senator Penny Wong,  
Senator Rex Patrick,  
Senator Sarah Hanson-Young,  
Senator Simon Birmingham

Mr Brett Walker QC , MDB Royal Commissioner  
Mr Philip Glyde, Chief Executive, MDBA

### List of references cited

Boon, P. 2000. Biological impacts of changes to water level and salinity in the Coorong. Prepared for the Upper South East Dryland Salinity and Flood Management Scheme. School of Life Sciences and Technology, Victoria University, Melbourne

Geddes, M.C. & Butler, A.J.. 1984. Physiological and biological studies on the Coorong lagoons, South Australia and the effect of salinity on the distribution of the macrobenthos. *Transactions of the Royal Society of South Australia* **108**: 51-62

Jensen, A., Hoey, P., Kopli, P., Shpeherd, M., Till, M., and Weinert, M. 1983. The effects of drainage n groundwater behaviour in Counties Cardwell and Buckingham and the effect on the Coorong. A report for the Minister of Water Resources 1981-1983. South Australian Department of Environment and Planning.

Kotwicki, V. & Clark, R. 1990. Coorong salinity processes and options to reduce Coorong salinity. Engineering and Water Supply Department of South Australia, Adelaide.

McCourt, T and Mincham, H. 1987. The Coorong and lakes of the Lower Murray. (Beachport Branch of the National Trust, Adelaide)

Noye, B. J. 1974. Waters of the Coorong Lagoons. *In* Noye, J. (ed) The Coorong pp 59-79. (Dept of Adult Education, University of Adelaide, Adelaide)

Womersley, H.B.S. 1974. Plant Life in the Coorong Lagoons. *In* Noye, J. (ed) The Coorong pp 81-88. (Dept of Adult Education, University of Adelaide, Adelaide)

Upper South East Dryland Salinity and Flood Management Plan Steering Committee. 1993. Upper South East Dryland Salinity and Flood Management Plan Draft Environmental Impact Statement – for Public Comment. Prepared for the Natural Resources Council of South Australia.



Extensive cover of filamentous green algae that developed in spring 2016 in the south lagoon of the Coorong. This is indicative of over eutrophication of the southern Coorong.



Image showing filamentous green algae in USE water as it is released from Salt Creek