
Deserts or dryland areas might seem strange places to find flowing water yet many thousands of ephemeral and intermittent streams as well as large rivers flow entirely or partly through areas where the annual rainfall is less than 500 mm. A distinguishing feature of most dryland rivers is their highly variable discharge (flow) patterns in landscape space and through time. Discharge 'signatures' can vary from predictable seasonal variability in allogenic rivers (e.g. the Green River, Utah) to extremely unpredictable endogenic regimes characterised by long periods of low or no flow punctuated by variable channel flows or very large floods (e.g. rivers such as Cooper Creek and the Diamantina River in the Lake Eyre Basin, Australia). Habitat structure in desert rivers is as variable as the flows
that drive processes of sediment erosion and deposition and so create landscape to local geomorphological form. Across this physical template of flow, sediment and habitat variability the ecological processes of dryland rivers play out in often spectacular ‘boom and bust’ patterns of recruitment and productivity, mortality and decay, only to bloom again following infrequent floodplain inundation. The ecological drama of highly stochastic events in dryland river ecosystems, and how to manage these ecosystems sustainably, form the substance of the book ‘Ecology of Desert Rivers’ edited by Richard Kingsford and written by Kingsford and other freshwater ecologists from Australia, South Africa, the United Kingdom and the USA.

The book is structured around three main themes: understanding, appreciating and sustainably managing dryland river ecosystems around the globe. It is divided into 12 chapters in two main sections: the first covers natural disturbance in desert river ecosystems, the second documents human interventions and impacts on the hydrology and ecology of desert rivers, and future prospects for dryland river ecosystems under scenarios of increasing human demands for freshwater and climate change.

Chapters 1 and 2 set the scene for the ecological meat of the book. Chapter 2 “Flow variability in large unregulated dryland rivers” (Young and Kingsford 2006) describes and compares the nature of flow variability in large rivers of arid and semi-arid (dryland) and humid regions, and presents early glimpses of the profound ecological implications of extreme flow variability in various geomorphic settings. Desert rivers with more predictable flow regimes fade from the scene at this point in the book which is a shame as the contrasting adaptive strategies of plants and animals living in predictable and unpredictable desert rivers would make interesting reading, and also help us to understand the implications of interventions that reduce flow variability in dryland rivers.

The extreme natural disturbances associated with prolonged dry periods and intermittent flooding are the recurrent theme in five biological chapters packed with detail about largely opportunistic strategies that allow aquatic macrophytes, riparian trees, invertebrates, fish, amphibians, reptiles, mammals and birds to cope with and benefit from the ‘system resetting’ that occurs with the fluctuating presence of water. Chapter 7 “Vertebrates of desert rivers: meeting the challenges of temporal and special unpredictability” was of most interest to this reader. Here I found a useful treatment (Table 7.1) of the major types of habitat available to vertebrates and their adaptive strategies in nine different types of desert river habitat, but I was disappointed not to find more about the relationships between geomorphological processes that create and sustain habitat structure, and the consequences for biological diversity. Chapter 3 “Variability, complexity and diversity: the geomorphology of river ecosystems in dryland regions” (Thoms et al. 2006) makes a good start on ecogeomorphological integration but does not extend to implications for fish. My interest springs from research with Thoms and others on the fishes of Cooper Creek (Lake Eyre Basin) where we have found that geomorphological variability at the floodplain, waterhole and within-waterhole habitat scale, and low and high flow history, are strong drivers of spatial and temporal variations in the diversity, composition, and dry-season turnover of fish assemblages in isolated waterholes (Arthington et al. 2005) as well as life history responses of fish to flow variability and floodplain inundation (Puckridge et al. 2000). I feel that the ecology of fish living in desert rivers needs a chapter of its own.

Intermittent floods, sometimes inundating up to one third of the catchment, drive spectacular booms of floodplain recruitment, growth and productivity in desert rivers, bringing the parched landscape and mosaics of isolated, drying waterholes back to life. What sources of nutrients and organic matter drive the boom and bust ecology of desert ecosystems? Chapter 4 “Aquatic productivity and food webs of desert river ecosystems” (Bunn et al. 2002) offers interesting insights into the roles of allochthonous and autochthonous sources of energy in waterhole and floodplain foodwebs. It seems that riparian energy sources are far less important than algal biomass and production in sustaining aquatic foodwebs in desert habitats. Processes of leaf litter breakdown so familiar to us from ecological studies of mesic rivers are different in desert rivers, where it seems that leaf breakdown is driven more by leaching, microbial respiration and physical abrasion than by the activities of shredders, which form a very small component of the invertebrate fauna (Bunn et al. 2006; Boulton et al. 2006). Grazers and filter-feeders are the dominant trophic groups. The ecological significance of dissolved organic carbon in desert river food webs seems less well known, even though floodplain alienation and reduced flood frequency interact to greatly reduce the supply of catchment DOM in some dryland rivers (Thoms et al. 2006).

After learning so much about the natural ecology of desert river ecosystems around the world it will be a shock for many readers to delve into the next five chapters of doom and gloom – stories of massive hydrological intervention, floodplain alienation, salinization, river degradation, loss of biodiversity and ecosystems goods and services, and the displacement of whole communities of dependent peoples forced to abandon their traditional way of life (e.g. the Marsh people of Iraq, the fishing communities that once thronged the Aral Sea).

One of the joys of being given a new book to read and review (apart from keeping it) is to appreciate its physical appearance, and in this aspect “The Ecology of Desert Rivers” is pure pleasure. It is high quality throughout in page layout, font, the many useful tables and line figures, with good reference lists at the end of each chapter, and an informative Index. The binding is durable and the cover is immediately eye-catching, not least because it depicts the Cooper Creek floodplain, a landscape of awesome physical and ecological complexity and dynamism. The only presentation flaw in this excellent book is the quality of the black and white photographs, which seem to have been rendered fuzzy and too dark to see much detail, and the two global maps that contain much important detail about the geography of desert rivers (Figure 1.1) and
the distribution of large dams (Figure 8.1). These maps should be printed in full-page landscape format to achieve their full impact. A few colour photographs would bring the stunning physiognomy of desert landscapes to life.

My advice to anyone interested in river ecology and management is to buy this book and find out how dryland river ecosystems work, and how they should be managed, in some of the harshest conditions for freshwater life on the planet. These are not simply distant rivers that can be kept ‘out of sight, out of mind’. The lessons learned from research on desert rivers are important for all of humanity. Desert rivers provide the benchmarks for understanding the ecological and societal implications of water scarcity and extreme resource variability. Fresh insights and better understanding of desert river ecosystems will provide the foundations for development of new water management paradigms to guide management of the world’s more mesic rivers in the future (Kingsford 2006, Wishart 2006), especially in regions threatened by increasing population pressure, drought and climate change.

Literature cited (other than chapters in the book)


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