Cliff Ecology

Pattern and Process in Cliff Ecosystems

Cliffs are present in virtually every country on earth. The lack of scientific interest in cliffs to date is in striking contrast to how common they are around the world and to the attraction they have had for humans throughout history. Cliffs provide a unique habitat, rarely investigated from an ecological viewpoint. This book aims to destroy the impression of cliffs as geological structures devoid of life, by reviewing information about the geology, geomorphology, microclimate, flora and fauna of both sea and inland cliffs. For the first time, evidence is presented to suggest that cliffs worldwide may represent an invaluable type of ecosystem, consisting of some of the least disturbed habitats on earth and contributing more to the biodiversity of a region than their surface coverage would indicate.

The Cliff Ecology Research Group was formed in 1985 within the Department of Botany at the University of Guelph. The group is an interdisciplinary team that analyses the structure and function of cliff ecosystems.

DOUG LARSON began his career studying the ecology of coastal tundra, and then studied the ecology of lichens and mosses growing on rock outcrops in southern Ontario. He has won several teaching and research awards, and has attracted wide media coverage to the new area of cliff ecology.

UTA MATTHES worked on the ecology of coastal lichens in California and currently manages projects dealing with physiological, population, and community ecology.

PETER KELLY has previously worked on arctic soil formation processes, and now concentrates on dendroecology and demography.

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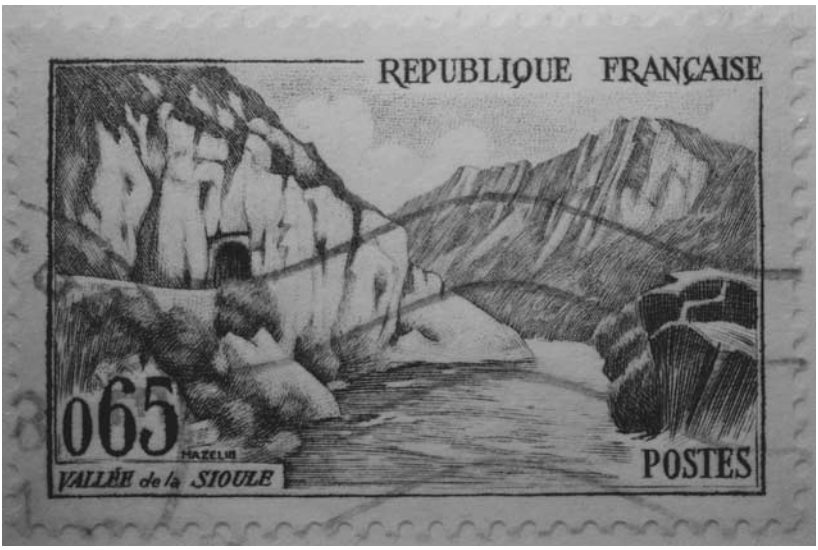

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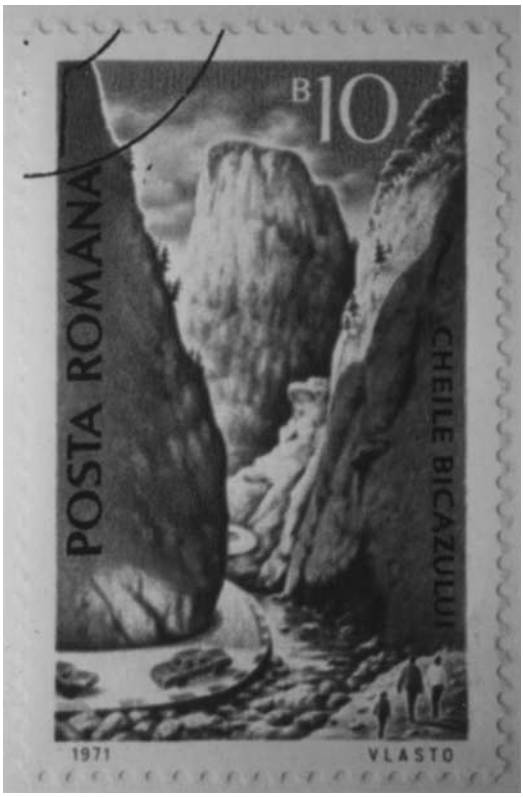

Preface

We have given ourselves the assignment of trying to write a book about places everyone sees, but no-one knows. In completing the work, we have tried to keep a number of things in mind. First, we recognize that readers have an insatiable curiosity for the truth, and within the context of natural history and ecology this is especially true because the answers to questions about non-human taxa sometimes help us interpret the significance of *Homo* to the world. This can comfort us. Second, we acknowledge the message that 'complex questions have simple, easy to understand, wrong answers'. Thus, the kinds of simple questions we ask may not provide simple answers, and in the work that follows we will try to simplify only when such efforts can provide reasonably precise and accurate versions of the truth. Given that this is the first book on the topic of cliff ecology, it may also happen that certain topics have been so understudied that no effective summaries or syntheses can be made. When problems like this are encountered, we will try to bring them to the reader's attention. Lastly, we will try not to misrepresent to the reader the source of the motivation for doing science in general, and cliff ecology in particular – we love cliffs. Sometimes in the writing of science these motivations become lost in the intricacies of logic. You all know the wording: 'In order to test whether species packing densities could be predicted from the equilibrium theory of island biogeography we sampled . . .' which translates into English as 'islands are fascinating.' While such theoretical arguments may attract many, we also believe that many scientists, like artists, study what they do out of sheer fascination. In our case, we have found a previously unknown presettlement forest ecosystem on cliffs of the Niagara Escarpment, in southern Ontario, Canada, within sight of Canada's largest city. We have found this discovery to be immensely exciting and we will try to present a volume that captures some of that excitement.

It has taken three years for the final text to be prepared. The task proved far more challenging than we thought at the time writing began. Still, we think that the text includes some interesting information that readers familiar with level ground will be surprised to read. There is also a modicum of speculation about the significance of cliffs in an increasingly human-dominated landscape, but we feel that a book is an acceptable place for such speculation. If nothing else, it will provide an incentive for others to prove such speculations wrong. Throughout the preparation of the book, we have been struck by the many counterintuitive aspects of the ecology of cliffs, and now we feel even more compelled than ever to have this volume read by research workers, educators, graduate and undergraduate students, naturalists and professional land managers. We have tried to consider each of these audience members in the writing of the text. Thus, in some instances in which a research scientist would want more information about experimental design or statistical interpretation, there will be disappointment. To any of such readers, we invite direct correspondence with us at the University of Guelph. In other instances, there may be too much detail about particular species or geological structures to permit the professional land manager or undergraduate to continue reading with any sense of enthusiasm. To these readers we offer our apologies in advance, and say that the details that we reviewed were far more exhausting than what we present here. So at least the book is much easier to follow than the source material. It is also all in one place! To readers in the middle of this spectrum we hope that this volume illustrates how easy it is to be blind to wonderful ecological systems that stare us in the face. We really do hope that small 'cliff ecology' or 'swamp ecology' or 'stream ecology' groups start developing over the landscape. A diversity of such multidisciplinary working groups cannot help but add perspective to the already large number of intensive discipline-based studies in the same 'places'.

Guelph, Ontario. August 1999

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Folgend dem Windzug kommen zum Felsen
die Wolken und weichen,
unveränderlich steht aber der Fels
in der Zeit.

[Following the wind, the clouds come
but they yield to the rock,
and the rock stands
unchanged
in time.]

Anonymous carving into limestone cliff in the Fränkische Schweiz, Germany.

thir callow young, but feathered soon and fledge
they summ'd thir penns, and soaring th' air sublime
with clang dispis'd the ground, under the cloud
In prospect; there the eagle and the stork
on Cliffs and Cedar tops their eyries build

Milton (1667) *Paradise Lost*, Book VII, 420–4.