

Proceedings of the International Ocean Discovery Program

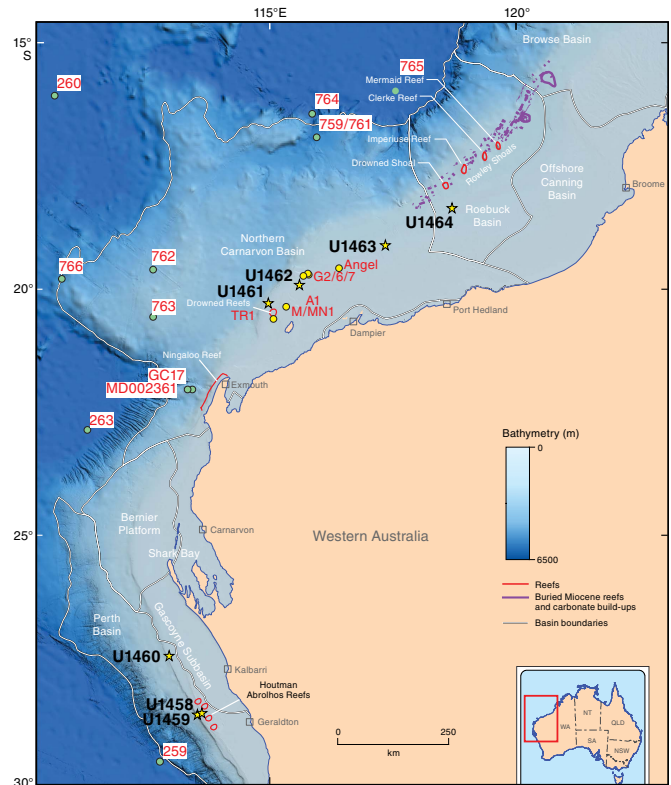
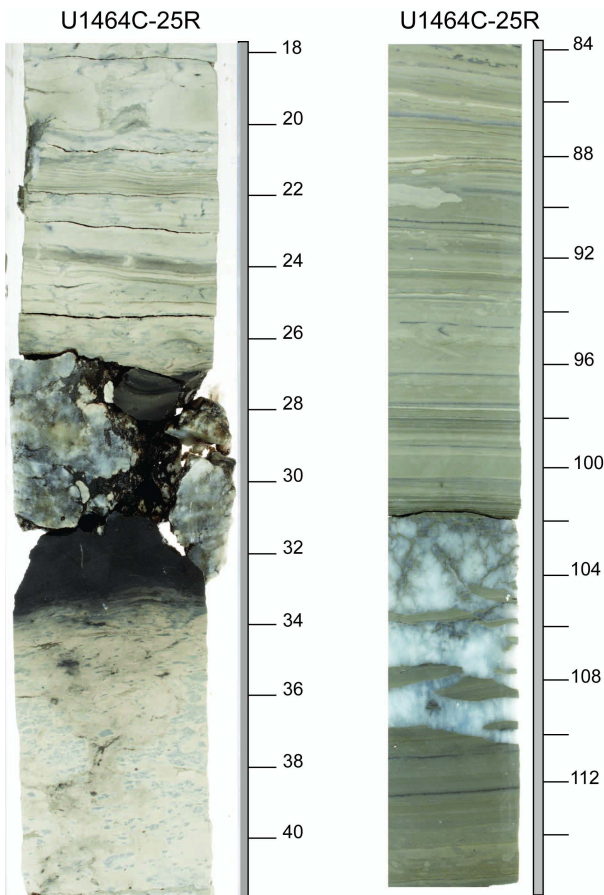
Volume 356

Indonesian Throughflow

Expedition 356 of the riserless drilling platform
 Fremantle, Australia, to Darwin, Australia
 Sites U1458–U1464
 31 July–30 September 2015

Volume authorship

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists



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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the participating agencies, TAMU, or Texas A&M Research Foundation.

The bulk of the shipboard-collected core data from this expedition is accessible at <http://iodp.tamu.edu/database/index.html>. If you cannot access this site or need additional data, please contact Data Librarian, International Ocean Discovery Program *JOIDES Resolution* Science Operator, Texas A&M University, 1000 Discovery Drive, College Station TX 77845-9547, USA. Tel: (979) 845-8495; Fax: (979) 458-1617; Email: database@iodp.tamu.edu.

A complete set of the logging data collected during the expedition is available at <http://brg.ldeo.columbia.edu/logdb>. If you have problems downloading the data, wish to receive additional logging data, or have questions regarding the data, please contact Database Administrator, Borehole Research Group, Lamont-Doherty Earth Observatory of Columbia University, PO Box 1000, 61 Route 9W, Palisades NY 10964, USA. Tel: (845) 365-8343; Fax: (845) 365-3182; Email: logdb@ldeo.columbia.edu.

Supplemental data were provided by the authors and may not conform to IODP publication formats.

JRSO expedition photos are the property of IODP and are in the public domain.

Some core photographs have been tonally enhanced to better illustrate particular features of interest. High-resolution images are available upon request.

Cover photograph shows sabkha facies (left) and tidal flat dolostone with intertidal laminations and anhydrite (right), Core 356-U1464C-25R (depths are centimeters within the core section). Photo credit: IODP JRSO.

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Contents

Expedition reports

Chapters

[Expedition 356 summary](#)

S.J. Gallagher et al.

[Expedition 356 methods](#)

S.J. Gallagher et al.

[Site U1458](#)

S.J. Gallagher et al.

[Site U1459](#)

S.J. Gallagher et al.

[Site U1460](#)

S.J. Gallagher et al.

[Site U1461](#)

S.J. Gallagher et al.

[Site U1462](#)

S.J. Gallagher et al.

[Site U1463](#)

S.J. Gallagher et al.

[Site U1464](#)

S.J. Gallagher et al.

Core descriptions

Visual core descriptions (VCDs) are presented in PDF files for each site. Smear slide and thin section CSV files are available in the CORES directory. The entire set of core images in PDF is available in the IMAGES directory.

[Site U1458](#)

[Visual core descriptions](#) · Smear slides · Thin sections

[Site U1459](#)

[Visual core descriptions](#) · Smear slides · Thin sections

[Site U1460](#)

[Visual core descriptions](#) · Smear slides · Thin sections

[Site U1461](#)

[Visual core descriptions](#) · Smear slides · Thin sections

[Site U1462](#)

[Visual core descriptions](#) · Smear slides · Thin sections

[Site U1463](#)

[Visual core descriptions](#) · Smear slides · Thin sections

[Site U1464](#)

[Visual core descriptions](#) · Smear slides · Thin sections

Supplementary material

Supplementary material for the Volume 356 expedition reports includes smear slide components in PDF. A full list of directories can be found in SUPP_MAT in the volume zip folder or on the [Supplementary material for Volume 356 expedition reports](#) web page.

Expedition research results

Data reports

Titles are available in [HTML](#).

Syntheses

Titles are available in [HTML](#).

Drilling location maps

A site map showing the drilling locations for this expedition and maps showing the drilling locations of all International Ocean Discovery Program (IODP) expeditions, produced using QGIS (<http://www.qgis.org>), and all Integrated Ocean Drilling Program, Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DSDP) expeditions, produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.F. Smith (<http://gmt.soest.hawaii.edu>), are available in PDF.

[IODP Expedition 356 site map](#)

[IODP map](#) (Expeditions 349–356)

[Integrated Ocean Drilling Program map](#) (Expeditions 301–348)

[ODP map](#) (Legs 100–210)

[DSDP map](#) (Legs 1–96)

Dedication

We dedicate this volume to Professor Lindsay Collins (Curtin University, western Australia) who passed away on 2 September 2015. His ground-breaking research on the late Quaternary reef development and modern carbonates off the west coast of Australia over the last 30 years inspired us to core deeper into their ancient history.

Acknowledgments

We thank the proponents of Proposal 807-Full (the proposal that led to Expedition 356) for their contributions to the formulation of the hypotheses tested during this expedition. In particular, we thank the following proponents: Andrew Heap (Geoscience Australia), who also coordinated access to the majority of the expedition site survey data; Christian Heine (University of Sydney/Shell International); Karol Czarnota (Geoscience Australia); Neville Exon (Australian National University), a Program Scientist for ANZIC who facilitated workshops leading to this expedition; David Greenwood (Brandon University, Canada); Nicholas Herold (Purdue University, USA); Yasufumi Iryu (Tohoku University, Japan); Willem Renema (Netherlands) a shipboard scientist during Expedition 356; Yair Rosenthal (Rutgers University, USA); Tokiyuki Sato (Akita University, Japan); Kale Sniderman (University of Melbourne), a shore-based scientist for Expedition 356; Asrar Talukder (CSIRO Petroleum, Australia); Barbara Wagstaff (University of Melbourne, Australia); and Malcolm Wallace (University of Melbourne, Australia). We also thank Mike Wiltshire of Occam Technology Pty. Ltd. (Australia) for the donation of wireline log data.

Foreword

The International Ocean Discovery Program (IODP) represents the latest incarnation of almost five decades of scientific ocean drilling excellence and is generally accepted as the most successful international collaboration in the history of the Earth sciences. IODP builds seamlessly on the accomplishments of previous phases: the Deep Sea Drilling Project, Ocean Drilling Program, and Integrated Ocean Drilling Program. The 2013–2023 IODP Science Plan (*Illuminating Earth's Past, Present, and Future*) defines four themes and thirteen challenges for this decade of scientific ocean drilling that are both of fundamental importance in understanding how the Earth works and of significant relevance to society as the Earth changes, at least in part in response to anthropogenic forcing. This phase of IODP represents a renewed level of international collaboration in bringing diverse drilling platforms and strategies to increasing our understanding of climate and ocean change, the deep biosphere and evolution of ecosystems, connections between Earth's deep processes and surface manifestations, and geologically induced hazards on human timeframes.

The *Proceedings of the International Ocean Discovery Program* presents the scientific and engineering results of IODP drilling projects, expedition by expedition. As in the preceding Integrated Ocean Drilling Program, expeditions in the new IODP are conducted by three implementing organizations, each providing a different drilling capability. These are the US Implementing Organization (USIO; through September 2014) and the *JOIDES Resolution* Science Operator (JRSO; as of October 2014), providing the leased commercial vessel *JOIDES Resolution* for riserless drilling operations; JAMSTEC's Center for Deep Earth Exploration (CDEX), providing the drillship *Chikyu* for riser and occasional riserless operations; and the European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO), providing "mission-specific" platforms (MSPs) for expeditions that extend the IODP operational range where neither drillship is suitable, for example, in polar environments and in shallow waters. Scheduling decisions for each capability are made by three independent Facility Boards, each of which includes scientists, operators, and platform funding partners: the *JOIDES Resolution* Facility Board (JRFB), *Chikyu* IODP Board (CIB), and ECORD Facility Board (EFB). At the beginning of the new IODP, the three Facility Boards agreed to utilize Publication Services at the USIO and now the JRSO for production of all expedition *Proceedings* volumes and reports.

The new IODP differs from prior scientific ocean drilling programs in that it has neither a central management organization nor commingled funding for program-wide activities. Yet this phase of IODP retains a fundamental integrative structural element: a "bottom-up" evaluation of all proposals for drilling expeditions by a single advisory structure composed of scientists representing all international program partners. International scientists may submit drilling proposals to the Science Support Office; all submitted proposals are then evaluated by a Science Evaluation Panel in the context of the Science Plan.

The new IODP also has a second internationally integrative level for high-level discussion and consensus-building: the IODP Forum. The Forum is charged with assessing program-wide progress toward achieving the Science Plan. At present, IODP involves 26 international financial partners, including the United States, Japan, an Australia/New Zealand consortium (ANZIC), Brazil, China, India, South Korea, and the eighteen members of ECORD (Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom). This enhanced membership in the new IODP represents a remarkable level of international collaboration that remains one of the greatest ongoing strengths of scientific ocean drilling.

James A. Austin Jr.
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JOIDES Resolution Science Operator

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Expedition-related bibliography*

IODP publications

Scientific Prospectus

Gallagher, S.J., Fulthorpe, C.S., and Bogus, K.A., 2014. *Expedition 356 Scientific Prospectus: Reefs, Oceans, and Climate*. International Ocean Discovery Program. <http://dx.doi.org/10.14379/iodp.sp.356.2014>

Preliminary Report

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, 2017. *Expedition 356 Preliminary Report: Indonesian Throughflow*. International Ocean Discovery Program. <http://dx.doi.org/10.14379/iodp.pr.356.2017>

Proceedings volume

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Expedition reports

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Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y., Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Expedition 356 methods. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.102.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y., Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1458. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.103.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y.,

Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1459. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.104.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y., Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1460. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.105.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y., Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1461. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.106.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y., Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1462. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.107.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y., Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1463. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.108.2017>

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., Auer, G., Baranwal, S., Castañeda, I.S., Christensen, B.A., De Vleeschouwer, D., Franco, D.R., Groeneveld, J., Gurnis, M., Haller, C., He, Y., Henderiks, J., Himmler, T., Ishiwa, T., Iwatani, H., Jatiningrum, R.S., Kominz, M.A., Korpanty, C.A., Lee, E.Y.,

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Levin, E., Mamo, B.L., McGregor, H.V., McHugh, C.M., Petrick, B.F., Potts, D.C., Rastegar Lari, A., Renema, W., Reuning, L., Takayanagi, H., and Zhang, W., 2017. Site U1464. In Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, *Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.109.2017>

Supplementary material

Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, 2017. Supplementary material, <http://dx.doi.org/10.14379/iodp.proc.356supp.2017>. *Supplement to Gallagher, S.J., Fulthorpe, C.S., Bogus, K., and the Expedition 356 Scientists, Indonesian Throughflow*. Proceedings of the International Ocean Discovery Program, 356: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.356.2017>