Warm and cold phases of ENSO exhibit significant asymmetry in their transition/duration. El Nino tends to turn rapidly into La Nina after the mature phase, while La Nina tends to be sustained for up to two years after the mature phase. Possible role of sea surface temperature (SST) anomalies in the Indian Ocean (IO) on the asymmetry of ENSO transition/duration is investigated by use of the fifth version of the Model for Interdisciplinary Research on Climate (MIROC5). We conducted decoupled-IO experiments to assess the asymmetric role of IO feedback on the ongoing Pacific SST anomalies. While the warm IO SST anomalies enhance surface easterlies over the equatorial western Pacific during the mature to decay phase of El Nino, the cold IO SST anomalies during La Nina do not have a significant impact on the Pacific sector. In the El Nino phase, the boreal winter’s (December-January-February) Nino-3.4 index in the decoupled-IO run is significantly incoherent between the mature period and afterward when compared with that in the control run; such a difference in duration was not found for La Nina between the coupled- and decoupled-IO runs. Additional identical-twin forecast experiments show that a coupling of the IO extends the useful (ACC > 0.5) prediction of the warm phase of ENSO by about 1 year, which is about 8 months without the IO coupling. The effect of IO coupling on the predictability of the Pacific SST is much weaker in the decay phase of La Nina.